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Right of Contract in Organizations.

In many, if not in all, of the chief questions involving the relations of capitalist, laborer and consumer that are to-day in dispute the pivotal problem is to find the true line of division between the right of men to enter into such contracts as they choose and the right of the State to impose restrictions upon them for the good of the community. Freedom of private contract is constitutionally guaranteed, but it is subject to important limitations, and in defining these the difficulties arise. The courts will not sustain agreements contrary to statute or common law or to "public policy." Public policy is an elastic term, and makes an erratic gage when applied by different courts. A principle of common law is that contracts in restraint of trade are opposed to public policy, yet at the present time no rule is more variously construed than this.

The power in the State to abridge freedom of contract is a double-edged sword, cutting sometimes against capital, sometimes in its favor. Where an organization of wealthy men by offering fair inducements secures an agreement from weaker interests in the same trade to give up business, or even when it reinforces these inducements by patronizing only such transportation companies as shall discriminate in rates against its competitors, the members of this association are claiming a liberal construction of their right to contract freely between themselves and with outsiders. In this case it is the people calling for statutes and decisions invalidating these agreements who are seeking to restrict the right of contract. Again, it is the capitalist whose interest is on the side of free contract when he conditions the employment and retention of his men upon an agreement not to belong to a labor union; and it was the labor influence upon the New York Legislature which inserted section 171 "A" in the Penal Code, rendering such stipulation a misdemeanor on the employer's part.

On the other hand, where workingmen attempt to dictate through their union, under threat of strikes, the conditions of their employment and the personnel of their fellow workmen, it is they who seek a broad application of the right to contract, and it is the moneyed interests to whose prejudice it operates.

A decision lately handed down from the Appellate Division of the New York Supreme Court (which, it may be explained, is not the court of last resort here, but still one whose decisions carry a good deal of weight) establishes an important precedent as to the right of union workmen to choose their fellow employees, and incidentally as to other questions involving freedom of contract on the part of combinations.

There was a controversy between two associations of steam fitters—the National and the Enterprise. Members of the Enterprise Union went to buildings on which National men were working and were procuring their discharge by making threats to the employers that if they were retained the members of the Enterprise, and also of its allied unions, would quit. The National Union thereupon obtained a restraining injunction, and this the court has dissolved. From the meager report of the case which we have seen, it is not quite clear whether this injunction was addressed to the members of the Enterprise Union or to the employers, but the drift of the decision is sufficiently obvious. The court plainly states the absolute right of a workman to say for whom and with whom he will work, and the absolute right of the employer to say whom he will employ. Moreover, it goes on to say that if the individual workman has this right, "he does not lose it when acting with others clothed with an equal right, so that employers may continue to say they will not employ persons who are members of labor organizations, and laborers may continue to say they will not work for employers who engage any but members of labor organizations."

The opinion here rendered is certainly a radical departure from common law principles. It used to be held to make a vast difference whether one man did a certain thing or two or three conspired together to do it. It was lawful for persons to hiss an actor on their individual responsibility, but unlawful for them to do so by joint arrangement. Peaceable methods to which A might legally resort to injure the trade of B were criminal if A brought C to help him. This theory underlies modern conspiracy legislation, whether directed against labor unions or against "the trusts." Just how far the new decision, if affirmed in the Court of Appeals, will go to nullify existing legislation upon these matters is impossible to predict, but it may be characterized as a strong application of the principle of contractual freedom to the toleration of combinations.

In view of the decision it has been commented that such toleration of combinations implies that there shall be a fair field and no favor, and that these combinations shall have no advantages not possessed by individuals. This is sound sense. The refusal of legislature and courts to nullify the contracts of corporations on the ground that they create a monopoly is a thing by itself, and carries no guarantee that the Government will render possible monopolies, or even the existence of corporations through favorable charters, franchises or tariff protection.

Attention has been called to the laws which require municipalities to purchase only such materials as the unions furnish. This, it is argued, gives them an advantage as compared with the non-unionists to which, under the theory of equality for all, they are not entitled. In reply to this, however, it might be subtly—and perhaps

unprofitably—reasoned that the laws prescribing from whom the materials shall be purchased are merely the method by which the public states its own terms when acting as a contracting party and that it has a right to do so. A rigorous application of the principle would doubtless lead to endless complications and reactive effects.

In respect to labor unions it should be unnecessary to emphasize the fact that nothing in the decision rendered should afford them the least encouragement to carry out their plans by other than peaceable methods.

That country is happiest which has fewest laws. Men cannot be legislated into the Kingdom of Heaven. Fidelity presupposes trust; responsibility, privilege. Any increase of personal liberty and curtailment of the restrictions imposed by a paternal government are to be welcomed cordially if there is a chance of its working passably well. The ruling of the Appellate Division, then, is founded upon what we think is a substantially correct principle, even though it may ignore temporary evils which call for special and drastic treatment.

A Competent Engineer.

An "engineer" of a stationary engine may get along if he can keep up steam, attend to the feed water, oil the engine and manipulate the throttle. A locomotive or a marine engineer, however, cannot be too skillful and resourceful. It has been within the power of a marine engineer many times to be the savior of his ship and of the lives of those aboard. We do not know that Engineer A. B. Geerie, of the "Border Knight," which arrived in New York July 17 from Port Natal actually saved the ship, but he certainly accomplished a difficult feat in emergency engineering. The tail shaft broke on July 2, the propeller being lost with the end of the shaft. First, the cargo was shifted and the fore hold flooded, so that the stern bearing was raised above the water line. Then the thrust shaft, or middle portion of the line, was uncoupled and lifted out of the way, and the broken shaft drawn in, a temporary plug closing the hole. It happened that there was a spare piece of shaft and a propeller aboard, and these were successfully placed in position, the propeller securely keyed, and the heavy nut behind it screwed up by an improvised wrench. This is all simple and easy enough as it is told, but it is to be remembered that this was not all done on a lake or a river, but on the never-resting Atlantic. The vessel never ceased its pitching, and he who worked outside to put in the plug as the shaft was drawn inboard was sometimes under water as well as sometimes above it; and then all the subsequent operations in detail in getting on the wheel and properly securing it, done under the conditions that must have prevailed, involved not only skill and judgment of the highest order, but also personal bravery and determination in no lesser degree. The entire job took a little over four days, and the steamer completed her voyage and came into port as though nothing had happened. If this repair had not been made, the steamer might have been towed in, and then there would have been an enormous bill for salvage. It is to be hoped that the services of the brave engineer were recognized and that he was *paid*, not given, "an adequate compensation."

A New Gun.

A daily paper which is usually pretty reliable publishes an account of a new shoulder gun, the invention of Dr. McClean, of Cleveland, Ohio. The statement is made that a company formed to manufacture this new arm has purchased the Remington plant at Ilion, and that troops will eventually be supplied with shoulder guns, each one of which will be capable of discharging 1,000 shots a minute. The gun is automatic—extracting the shell, reloading and firing by power obtained by using a portion of the gases, and it is asserted that the arm not only has no recoil, but that it has, so to speak, a negative recoil, so that if laid upon a table and set in operation it will discharge its shots and at the same time creep slowly forward, instead of jumping backward. There is a limit to our credulity, and that limit is passed when we are asked to believe this recoil story. We still have faith in the old law learned in our school days, that "Action and reaction are equal and in opposite directions," and we don't believe that a gun has been, or ever will be, constructed that can throw shot in one direction without being itself impelled, more or less, in the opposite direction.

Railroad Employees in Public Office.

It is announced that the Baltimore & Ohio Railroad has forbidden its employees to be candidates for any political offices whatever, great or small, Superintendent Stewart saying:

"We have issued the order because we think railroad men should steer clear of political offices. Railways, being common carriers, do not want to prejudice their patrons against them, which might be a result of its employees' running for office, with the usual party bitterness that accompanies campaigns."

With all due respect to Mr. Stewart and the officials of the Baltimore & Ohio Railroad, we think that this is a wholly unwarranted position for any railroad or other corporation to take. Every man who lives in America has certain duties to perform as a citizen of his country. It is not his duty to seek political office, but it is sometimes his duty to accept it. For instance, a man's neighbors and friends may conceive the idea that he could render them a service by becoming a member of the school board or of the municipal legislative body. If they think so, and ask him to be their candidate, he cannot, consistently with his duties as a citizen of this country, refuse. He could in most cases fill such an office without in any way prejudicing the interests of the road, and without in the least lessening his value as an employee to the road. Where an employee of a railroad, or of any other company, or of an individual for that matter, pays so much attention to politics as to make himself a nuisance, or seriously impair his usefulness, the obvious and the proper thing is to discharge him; but to make a sweeping rule, saying that thousands of American citizens will under no conditions be allowed to discharge one of the plain duties of American citizenship is, in our opinion, wrong.

The Spanish patent laws are very unsatisfactory to British and other foreign machine builders. These laws allow any machine, process, or manufactured article to be patented, whether it be a *bona fide* invention or not, provided it has not been already built or carried out in Spain. The fact of its being common property elsewhere is no bar to granting the patent. Patents are granted for a principle, without requiring any indication as to how this is to be carried out practically. The consequence is that many machines patented in the United Kingdom for manufacturing goods in common use cannot be introduced into Spain simply because a patent has been taken out to manufacture these goods; therefore, though the machine itself is not the object of any patent in this country, yet as its product is thus protected, no one can use it except the holder of the patent—"The Engineer," London.

Someone has been figuring in an interesting way in the New York "Sun" on the power employed for electric lighting in this city: "Including isolated plants, the grand total must be about 3,000,000 lamps, representing at least 250,000 horse-power. Some idea of this power may be had from the fact that it represents the joint output of more than 200 locomotives, is more than the combined horse-power of Sampson's and Dewey's squadrons in the war, and requires the consumption of 2,000 tons of coal an hour, or a ton in less than two seconds, while all the lights are burning." This is a striking way of putting the matter, and we have no doubt that there is some approximation to the facts as to the horse-power, but we are unable to make the coal consumption so high. Allowing 4 pounds of coal per horse-power per hour, that for 250,000 horse-power would be 1,000,000 pounds of coal per hour, or 500 short tons.

Commercial Review.

New York, Saturday, July 21.

MACHINE TOOLS AND OTHER MACHINERY.

Although the tool business in this city is quiet, its atmosphere is less oppressive than the weather has been, and at the present rate sellers can get along very comfortably until the cool weather brings a resumption of orders. Claims are made that the majority even of prominent tool builders are conceding low prices, although they have not openly announced reductions, but inquiry among the agencies indicates that, on the other hand, makers are maintaining prices well. It is a question chiefly whether a company has orders enough still to keep going comfortably as matters stand. That contracts are gradually getting worked off is evidenced partly by the lists of tools for prompt delivery that some manufacturers are sending out. But it appears that the controlling factors of the tool industry are holding their own, so perhaps they may be tided through the summer and meet an autumn resumption of buying without being confronted by a crisis fatal to values. One of the largest interests in the trade could run its shops for two months yet with contracts now on hand.

An order was placed a few days ago for five Niles cranes for the Philadelphia & Reading Railroad shops at Reading, Pa. Two of these are 120-ton cranes, and the total amount of the contract is in the vicinity of $60,000.

A tendency exists in Spain to increase the manufacture of machine tools. These can be produced at a much lower price there than in Great Britain, but they are very inferior in quality to English and American tools. The home manufacture is stimulated by easy terms of payment. There is a demand in Spain for steam engines and boilers, especially for high-speed engines for driving electric plants where water power is not available. In many instances, continental machinery has been taken through the inability of the British makers to supply within a reasonable time.

The Sprague Electric Company, New York, has lately received some large orders for direct-connected slow-speed motors and generators from well-known firms who are building new factories in their respective cities. The Weston Electrical Instrument Company, Newark, N. J.; the Ithaca Wall Paper Mills, Ithaca, N. Y., and Chas. M. Higgins & Co., manufacturers of drawing inks, Brooklyn, N. Y., are among those who have ordered. The motors for the last named firm are of the new enclosed type. These plants are to be entirely equipped with the Sprague apparatus.

ITALIAN TARIFF ON ELECTRICAL MACHINERY UNDER NEW RECIPROCITY TREATY.

Notification of official Italian ratification of a new tariff reciprocity treaty with Italy has been received at Washington, and the President has proclaimed it in force July 18. The agreement is to remain in force until the end of 1903, and thereafter until a year's notice of suspension has been given by one of the parties. The new schedule for such American metal goods as are affected is as follows:

Upon agricultural machinery, 9.00 lire per quintal. Upon detached parts of agricultural machinery: (1) Of cast iron, 10.00 lire per quintal; (2) of other iron or steel, 11.00 lire per quintal.

Upon scientific instruments:

(a) Of copper, bronze, brass, or steel—

1. With spyglasses or microscopes, or graduated scales or circles, spyglasses for use on land, monocles, binocles, lenses, detached and mounted, 30.00 lire per quintal.

2. Not provided with any optical instrument, nor with graduated scales or circles, 30.00 lire per quintal.

(b) Of all kinds in the construction of which iron is evidently predominant, 31.00 lire per quintal.

Upon dynamo-electrical machines—

1. The weight of which exceeds 1,000 kilogrammes, 16.00 lire per quintal.

2. Weighing 1,000 kilogrammes or less, 25.00 lire per quintal.

Upon detached parts of dynamo-electrical machines, 25.00 lire per quintal.

Upon sewing machines—

1. With stands, 25.00 lire per quintal.

2. Without stands, 30.00 lire per quintal.

A lire is worth about 19 cents and a quintal is 100 kilogrammes, so that one lire per quintal is at the rate of a little less than 9 cents per hundredweight.

The chief interest of this schedule in the way of machinery is in the rates on dynamo-electrical machines. Italy is rather a promising country for exporters in this line, especially because of the mountain streams well adapted to electrical utilization. American manufacturers need all the export encouragement they can get just at present, because of the competition which is soon to meet them from the big electrical factories now going up in England to use American inventions.

THE TRANSVAAL OUTLOOK.

Mr. A. Swingley, of Sheriff, Swingley & Co., a prominent machinery importing firm in the Johannesburg market, has lately arrived from England, and is at the New York office of the firm, 120 Liberty street. Mr. Swingley says that when he left London, about a month ago, the news of Lord Roberts' rapid advance had lately been received, and mining engineers who were expecting to place orders for machinery hurried back, considering that the most important thing at present was to be on the spot, and that placing the contracts could wait. As yet the Transvaal is only occupied in a military way, and is not opened for a resumption of industry and trade.

Mr. Swingley is of opinion that much of the more delicate apparatus used in the mines which has been lying around idle will have to be replaced. It will take probably six months to get the mines in operation. Labor, of which there is none now existing, will have to be drafted in. In the course of time a considerable number of new mines will probably be opened. With a stable government capitalists will feel more freedom in putting out their money than has been the case in the last few years. This extension work may open up in good proportions in less than a year's time, for plans are laid and orders will be placed as soon as the war is manifestly at an end. Indeed, some new equipments of the Randfontein Estates & G. M. Co. have already been ordered. While there is no immediate prospect for the rise of a machinery constructing industry in South Africa, there is considerable demand for machine tools for repair shops. Contracts for American machinery to equip several such shops have been placed in the last few weeks.

From another source we derive the list of ante-bellum importing firms in the Transvaal, which is given herewith. It is likely that many of these will return to their old stands as soon as the war is over.

In the following list are given the names of some importers of machinery and mining supplies at Johannesburg before the war: Herbert Ainsworth; Afro-American Company; Allen, Edgar & Co.; T. Thienhaus & Co.; Barsdorf & Co.; Brown & McKenzie; B. P. Brown, Ltd.; C. Cammell & Co.; Chapin & Manion; Chester, Edward & Co.; Commercial and General Agency; Geo. Cradock & Co.; Davey, Paxman & Co.; W. Deacon & Co.; Eadon, Moses & Sons; Fraser & Chalmers; H. Fuchs & Co.; C. C. George & Co.; E. H. Green & Co.; L. & L. S. Grunberg; Hamilton & Co.; Harvey & Co.; Hosken & Co.; H. Farrer & Co.; W. Jessop & Co.; A. Koppel; Lloyd & Lloyd; Macfarlane & Co.; G. North & Sons; Orenstein & Koppel; F. W. Peters; Raleigh & Rockey; Reid Bros.; G. S. Rideal; Reunert & Lenz; Robey & Co.; Theo. Seaf. Seligmann & Co.; Sheriff, Swingley & Co.; H. Sladden; Transvaal Trading Company; E. W. Tarry & Co.; Taylor, Shipley & Co.; United Engineering Company, Limited; C. F. Weinand; C. B. Wiley.

The following were hardware importers at Johannesburg: J. P. Ablett & Co.; T. Alcock & Co.; Barsdorf & Co.; Beckett & Co.; Beerstrecker & Co.; Boustred & Co.; W. P. Browe, Limited; B. M. Cotton & Co.; Douthwiate & Co.; Dunton Bros.; H. Farmaner & Co.; A. Fass & Co.; Felber, Jucker & Co.; J. Forrest & Co.; French South African Trading Company; H. Fuchs & Co.; Griffiths & Co.; H. J. Gerdes & Co.; B. Gundelfinger; W. B. Hall; Hanson, Schrader & Co.; H. C. Hawkins & Co.; Henwood & Co.; Hirsch, Loubser & Co.; W. Hoskin & Co.; W. F. Johnstone & Co.; C. J. Kettle & Co.; J. Lawrence & Co.; Lee & McCann; H. M. Light; E. Meyer & Co.; E.

Nettmann & Co.; J. & R. Nivin; G. North & Son; S. Olsen & Co.; Paddon & Brock; Parker, Wood & Co.; Parker Bros.; Peycke & Co.; Philip Bros.; H. P. Plaut; Raleigh & Rocky; Randles Bros. & Hudson; Reid Bros.; Rens, Herron & Co.; G. S. Rideal; E. & A. Royaly; S. P. Ruthoen; M. M. Steytler & Co.; S. Sykes; E. W. Tarry & Co.; Transvaal Warehouse Company; Transvaal Trading Company; A. P. Walker; Weeks & Johnson Company; C. F. Wierand & Daniels; Wiener, Schwab & Co.; C. B. Wiley; Wolff & Elias.

The following were importers of hardware at Pretoria: Beckett & Co.; Cairneross & Zillen; Co-operative Stores; W. Francis & Son; Izaak Haarhoff; Herrwood & Co.; A. Johnston & Co.; Ed. Meyers; Nettmann & Co.

CHICAGO MACHINERY MARKET.

Inquiries from railways and from large manufacturing plants for electrical equipment are numerous. The Chicago, Burlington & Quincy road has just bought for the new shops the company is erecting at Hannibal, Mo., most of the necessary machinery. The General Electric Company secured the contract for the three 150-kilowatt generators, and the Crocker-Wheeler Company the contract for the motors, fifty in number, ranging from 1 to 40 horse-power each. Three 275-horse-power engines were bought from the Westinghouse interests. It is reported that the Burlington Company has in contemplation the equipment of at least two of its remaining five or six shops with electrical power, though specifications have not yet been issued. The Santa Fe has specifications out, however, for an electrical outfit for one of its shops, and the Chicago & Alton road has asked for bids to equip its Bloomington (Ill.) shops with electrical power throughout. The Baltimore & Ohio road, also, is in the market in a small way for electrical power. Among large manufacturing plants now figuring for an electrical instalment is the Barney & Smith Car Company, Dayton, Ohio.

The Russell Engine Company, Massillon, Ohio, recently closed an order for generators and motors of several hundred horse-power. The Pullman Palace Car Company bought from the Crocker-Wheeler Company two motors for lighting their works at Pullman, Ill. Orders for small motors and generators have been quite numerous, current business being composed very largely of these smaller equipments.

The season for generators for lighting purposes is just opening and the outlook is good. Installation is expected by the time the days begin to grow short in the fall, and it has already become apparent that delays cannot safely be permitted. A buyer from Texas this week purchased at Chicago an equipment for lighting to be installed by September 1. An engine of about 50 horse-power was desired in connection with the generator, but a hurried survey of the market here showed that delivery for such an engine could not be obtained within ten weeks.

Notwithstanding the generally good trade reported there are some influences pulling back. One is the belief among some buyers that prices will be lower a little later. Another is the apathy in other markets. Inquiry for motors and generators for mining purposes is exceptionally brisk, and much electrical machinery is being shipped steadily to the Rocky Mountains, to Mexico and to other mining regions.

One of the largest printing companies at Chicago has had 120 motors in use for three years. They remark that during that time their total expenses for repairs were $48. This record is doubtless exceptional, due in part to the very excellent care they have taken of the shop machinery.

CINCINNATI REPORT.

Manufacturers of machine tools and allied lines here agree that there is little to rejoice over since the last report. An interview with the heads of the largest concerns hereabouts indicates that trade is quite dull, and even countermands are not an unheard of thing. Everyone, however, affects to believe that the lull is entirely a temporary one, and that by or about January 1 they will all be busy again. There has been no trouble with the foundrymen, as has been extensively published in the daily press, and the larger concerns say there have been no complaints on that score. A very few factories have closed down temporarily for lack of orders, and this is confined strictly to the smaller and newer concerns. President Charles F. Hilker, of the Hamilton Machine Tool Company, reports that concern having enough business booked to run them into the new year, and that the factory is running full ten hours daily. He adds: "If it were not for the excessive heat we would try to get in a little overtime." Foreign demand has fallen off considerably during the past six or eight months with all local concerns, but during that time domestic trade has increased very heavily, a great portion of it coming from the West and South. Probably the best satisfied heads of big manufacturing houses hereabouts are the owners of the electrical concerns which make power machinery. President George Bullock, of The Bullock Electric Manufacturing Company, has spent several days at Cincinnati headquarters, and is quite jubilant over recent sales. The company sold $70,000 worth of big generators, ranging from 250 to 900 kilowatts within a three-weeks' period. One was for The American Sugar Refining Company in New York, one for the big plate glass company, at Ottawa, Ill., and another for the Stanley Electric Manufacturing Company, at Pittsfield, Mass.

The Wadsworth Watch Case Company, of Dayton, Ky., is having placed a big storage battery, the largest ever installed in this section of the country. The concern will make its own electric light and furnish illumination for the town of Dayton. The battery is designed to carry all of the load instead of that part of it represented by the peak of the diagram. The town lighting will be furnished from the battery.

Cincinnati manufacturing concerns in the machine tool, pumping machinery and allied lines are cultivating a high type of professional penetration in making consignments to the Far East. Nearly all are holding back their shipments to Japanese, Chinese and Philippine ports until assurance is received that everything is all right. The case in point is that of the American Tool Works Company, which had an order for a large number of machine tools for Yokohama. Before shipping the machines the Cincinnati concern first assured itself that payment was guaranteed in New York. Many of the local concerns are shipping good-sized consignments to Manila. The William Powell Company has just sent a large consignment of valves and brass fixtures to be delivered in Manila for the Government. The goods are for the navy yards there. There is no very discernible break in prices here as yet. This, however, is not true of the smaller concerns.

Quotations.

NEW YORK, Monday, July 23, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:

No. 1 X foundry	$16 75 @ $18 00
No. 2 X foundry	15 75 @ 17 00
No. 2 plain	15 25 @ 16 00

Alabama Irons:

No. 1 foundry, or soft	18 75 @ 20 25
No. 2 foundry, or soft	17 75 @ 19 25
No. 3 foundry	16 75 @ 18 50
Foundry forge	16 25 @ 18 00

Bar Iron—Base sizes—The price on dock is 1.45 @ 1.55c. for good refined brands, and 1.90 @ 2.10c. for same from store.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 2 @ 2¼c.

Cold Rolled Steel Shafting—Base sizes —From store, 3 @ 3¼c.

Copper—Lake Superior ingot, 16½ @ 16⅝c.; electrolytic, 16⅜ @ 16½c.; casting, 16¼ @ 16⅜c.

Pig Tin—35c. for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4c., with .02½ @ .05c. extra for carloads, New York.

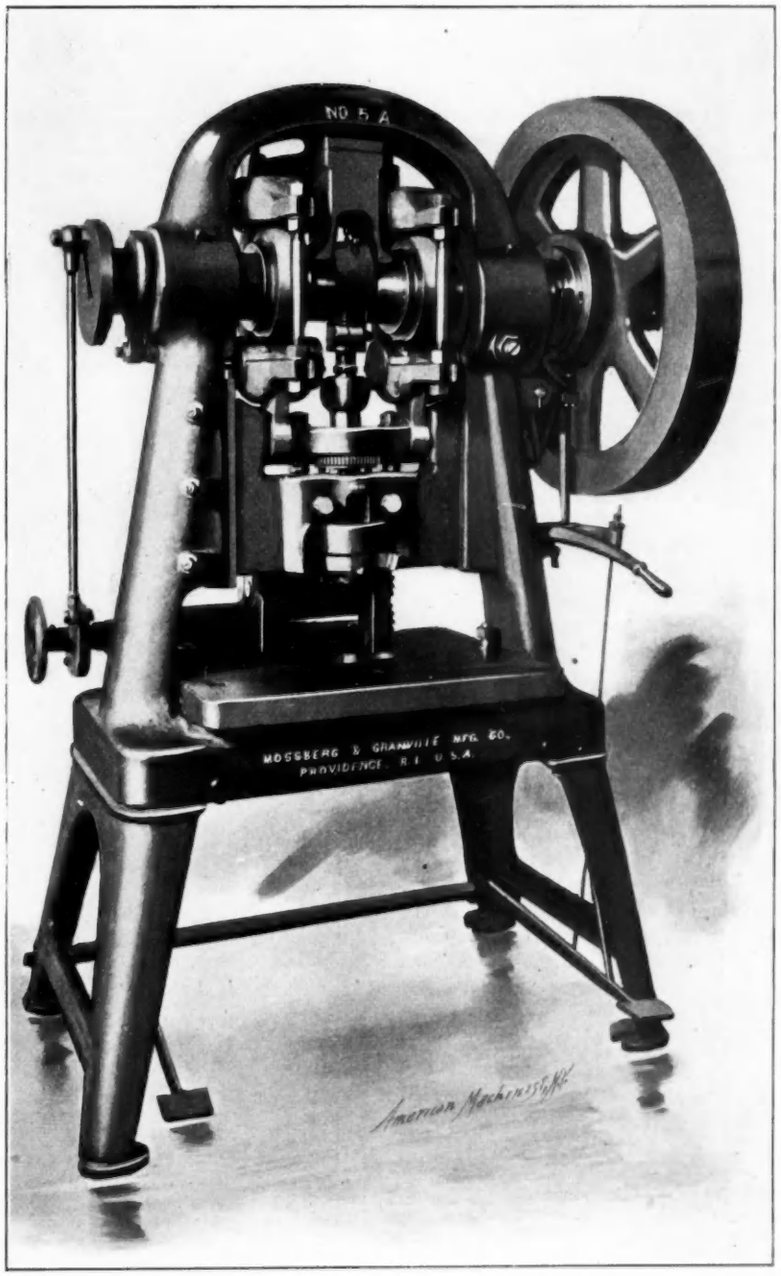
Spelter—Prime Western, 4.30 @ 4.35c., New York delivery.

Antimony — Cookson's, 10¾ @ 11c.; Hallett's, 9⅜c.; United States, 9⅜ @ 9½c.

A New Double-Acting Cam Press.

The half-tone shows a new double-acting press having several interesting features. The drawing plunger of the press is actuated by a central crank, and the slide by cams on each side working together. The slide is connected to the cams by yokes, and the downward pressure of the cams is received on large roll with roller bearings, which prevent the heating of the rollers. The slide is adjusted vertically by means of two screws, which are made to turn together by a large ring gear which meshes into a pinion on each of them. These adjusting screws are journaled in the slide crosshead, which is provided with a bearing at each end connecting the cam yokes. The pitman or connecting rod is connected to the drawing plunger by a ball and socket joint, and adjustment is provided by the ball stud screwed into the end of the connecting rod and held by a binding screw. The press is normally driven by a wide belt upon the periphery of the flywheel, but it may be made back-geared, in which case the belt would drive the back gear shaft. The flywheel, as here shown, is bushed with bronze, runs on the crank shaft and drives by a double pin clutch, the flywheel carrying the pins which engage with pins in the carrier on the outer end of the shaft. The usual brake is provided at the other end of the shaft. This press is adapted to use either roll, finger or dial feed attachment. The general design of this press is striking and deserving of study. The absence of sharp corners, the symmetrical lines and the combination of so many functions in a single casting are in harmony with the most advanced practice.

Some of the principal dimensions of this press are as follows: Weight of press, 3,950 pounds; stroke of slide, 1 inch; stroke of plunger, 2½ inches; hole in bed, 23x8 inches; floor-space, 63x38 inches; hight over all, 84 inches; speed of press, 100 turns per minute. The press is built by the Mossberg & Granville Manufacturing Company, Providence, R. I.



NEW DOUBLE-ACTING CAM PRESS.

Automobile Imperfections.

BY W. H. BOOTH.

The horse, or barley-motor, as one of my friends calls it, is an exceedingly useful animal. As a heat engine it is very efficient. Stoking is only necessary about three times a day, and, even if delayed, the motor is kept going by absorption of the material of the internal moving parts, and no permanent harm results if the delays are not too long or too frequent. The prevailing idea of the horse is a mistaken one, so far as regards its utility. Its one object in life has been, we have all thought, to draw vehicles or to carry loads upon its back; but I have recently discovered an unsuspected use for horses, one that has been of great, but unappreciated, value, and one from the loss of which, by the introduction of automobiles, I fear many of us are bound to suffer. This particular use to which I refer is the knocking over of foot passengers in the street. Before doing this I have observed that the horse does not attempt to make any less sound with its feet as it runs towards the person to be overturned. Ample warning is given by this hoof sound. Then, having knocked the passenger down, the horse does not appear to be vindictive. It tries to avoid treading upon its victim, and even pushes him to one side. Indeed, a certain benevolence appears to be the guiding motive—the passenger has been thus roughly handled, or footed, in order to put him out of the line of the wheels. The person who is thus knocked down is usually knocked well ahead, and at least 3 yards is allowed for the horse to come to a standstill.

Let him be compared with the automobile, especially the heavy automobile van of the tradesman. These are most aggressive vehicles. Their leading wheels stand well clear of the front of the vehicle and are the first to make connection with the passenger on foot. The person struck will be caught about the knees, will be promptly doubled up, and before he fairly touches the ground will be run over by the offending wheel. Now, it is one thing to be run over by a light vehicle drawn by a horse, and another thing to be run over by a steam or oil propelled vehicle of great weight. The automobile is not merely a worse vehicle to run over a man, but it is far more liable to do so. It car-

ries no barley-motor to sound its approach. It cannot be heard approaching on an asphalted street, and it simultaneously knocks you over and crushes you flat beneath its fore wheels.

The foregoing is a roundabout way of calling attention to the lack of thought on the part of automobile designers. Horseless vehicles they are truly, and in losing the horse their brains have gone also, and no designer seems yet to have applied his own brains to a humanitarian solution. No attempt whatever is made to guard the front of a vehicle. There is nothing of a springing or yielding nature to strike the unfortunate passenger, nor is there any attempt to put a wheel guard to push him away. Should any person be run over he must be most seriously injured, and probably killed if the vehicle be a van, and it would only be right that the proprietor should be called on a charge of manslaughter. Should I be so fortunate as to sit upon a coroner's jury in such a case, before I lie under one, I should not take long to find such a verdict as would put guards on other vehicles. I am afraid it would fall short of raising the price of hemp; that would not be my fault, but the law's. I cannot understand the blindness of eye and brain on the part of automobile builders that enables them to neglect so obvious and so necessary a precaution. The evil is glaring; the leading wheels appeal instantly to any half-observant eye, and cannot pass detection at once. All the vans that I have yet seen are of this evil type, and so also is a German motorwagen recently illustrated.

Designers of automobiles evidently had very narrow ideas on the complete function of that enclosed motor, the horse. Having turned him out of the shafts, they appear to have confined their efforts to the provision of an equivalent motive power for the deserted vehicle, to the general form of which they have adhered with painful Chinese mimicry. But again has their knowledge of the horse been proved wrong. One-horse vehicle equals one-horse motor. Two-horse van equals two-horse motor. Now, what little thought is here. A horse when doing a James Watt horse-power of 33,000 foot pounds per minute is also doing work in transporting his own weight of 2,000 pounds. This the automobile man overlooked entirely. He put the horse weight, or a good deal of it, into the vehicle and upon the wheels, and he provided 1 Watt horse-power. As though this were not already a sufficient oversight, he drew a horizontal straight line as the curve of output of the barley-motor, though there can be little doubt that a horse will do for a time perhaps 8 or 10 horse-power, without, as I have heard say, "a bustin' of hisself." This was another oversight. The output curve of a horse had many and high peaks in it, and if a dynagraph card could be looked at it would show that this error or omission was the more serious of the two. In electrical traction we have found out this thing, and we put in motors of 50 horse-power to draw passengers that were drawn in a two-horse car. Part of the 50 horse-power is put in for speed, and part for the better acceleration, but much of it goes in because the horse was a misunderstood beast. We know better now. It is terrible to think how much real cruelty might have been saved by taking dynagraph cards off a horse-pulled vehicle as we have taken them from steam-hauled trains. The mechanics of the horse have been neglected altogether, with the result that we have only appreciated his efforts after we have failed to obtain results from mechanical motors rated on his nominal power. Automobiles have only become really successful after a painful period of experience in grasping, or learning to grasp, the truth that should have been known to us for years, had we only employed existing apparatus and means of finding it all out. The inventor of Harveyized steel is said to have declared he would have invented nothing if he had first studied the methods of other inventors along the same lines. Does not this apply to the application of motive power to automobiles? But for the one horse-power set before us to copy we should earlier have discovered that a capacity of more than 33,000 foot pounds per minute was necessary to do the work that we now obtain from the horse, and the automobile would sooner have been a mechanical success.

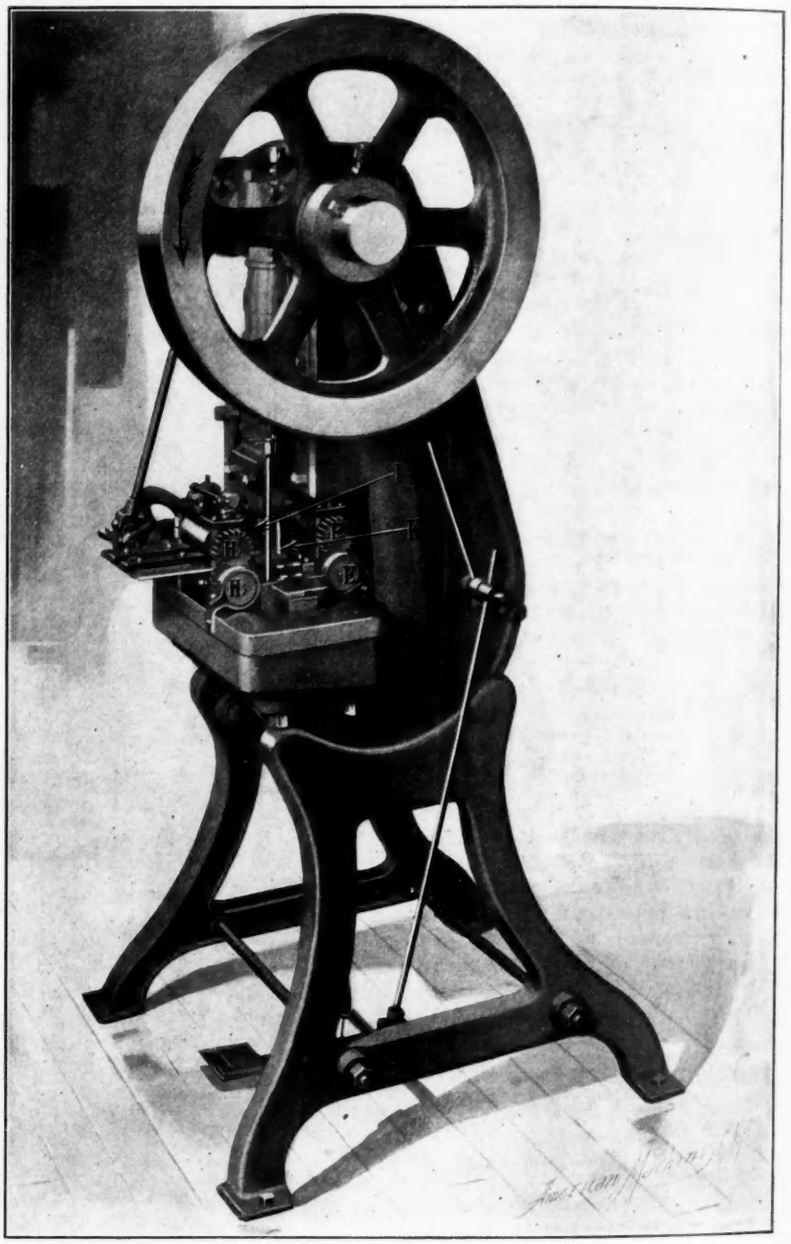


FIG. 1. A SPECIAL AUTOMATIC EMBOSSING AND FORMING PRESS.

As regards efficiency, it is probable that the horse is more efficient than the mechanical heat engine. The economy of the mechanical engine comes in the less cost per unit weight of fuel, and also arises from the fact that the horse consumes a considerable amount of fuel when not at work; first, to keep it warm, and secondly, no doubt, to enable it to store up energy from which it draws when at work. Excepting that the energy of the horse is derived from the oxidization of carbon, we do not know how the conversion of the heat energy to muscular energy is effected.

To return to the subject of wheel guards, I hope this will receive attention from American builders of, more especially, the heavier classes of vehicles. The neglect to do this is, I am sure, a serious omission, and evidence of paucity of thought and lack of consideration for the public safety.

London.

A Special Automatic Embossing and Forming Press.

We illustrate on this page a special automatic press for making tobacco tags. These tags are made of thin metal, usually colored on one side, the normal outline being that of a six-pointed star. The center of the star is embossed with a device in relief, and the points of the star are bent at right angles to the face, ready for piercing the material to which they are to be attached, the points being then bent inward or clinched to securely fasten the tag. Fig. 1 gives an enlarged view of the working portion of the press, from the operator's side, and Fig. 2 shows the entire press from the other side.

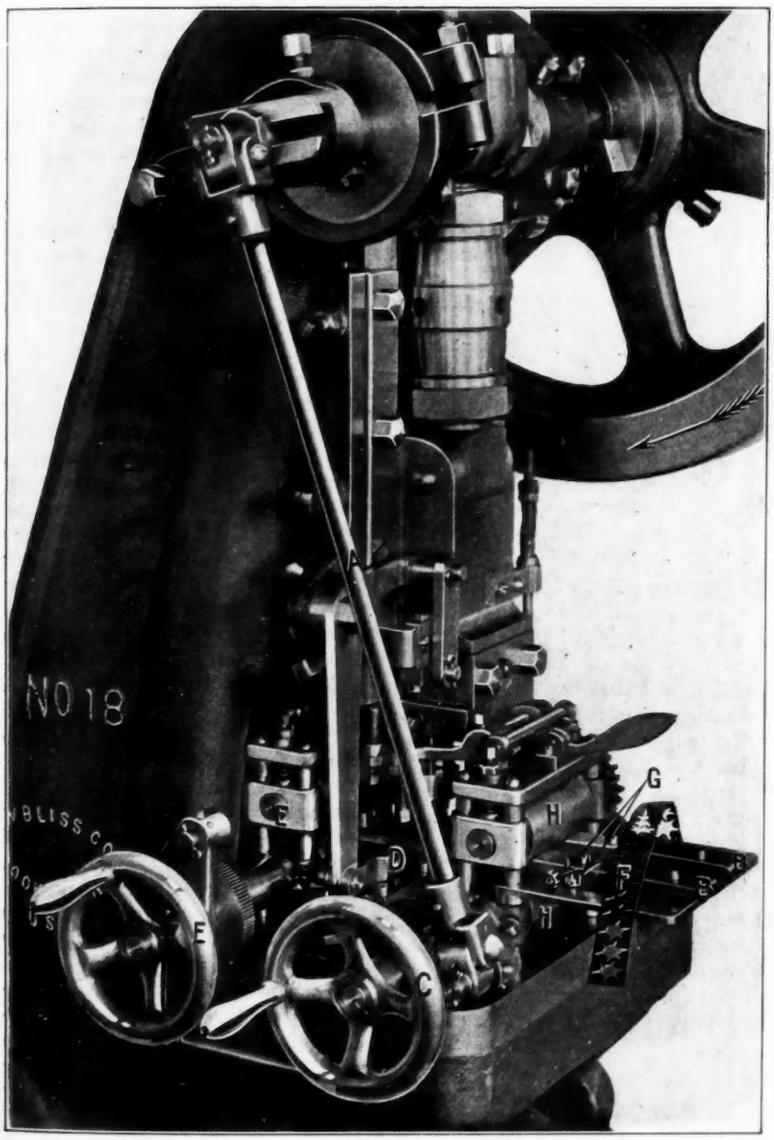


FIG. 2. SHOWING FEED AND DETAILS OF PRESS.

There are two distinct operations in the making of the tag, and these go on simultaneously, so that a tag is made for each stroke of the press, after it is in full operation. The blanking punch *I* is at the left, and the forming and embossing punch *K* is at the right as one stands in front of the machine. The automatic mechanism of the press consists of two distinct systems of feed, the first a double roll feed, which carries the strip under the blanking punch, and a lateral feed which deposits the blank in the embossing and forming die and afterwards expels it. The roll feed is operated by the rod *A*, connecting with an adjustable eccentric pin on the shaft at one end, and with a ratchet feed crank at the other. Motion is given to the lateral feed by the movement of the slide in connection with a series of levers.

A strip of stock of the proper width is placed between the guide-plates *B B*, and the hand-wheel *C* is then turned, carrying the strip a sufficient distance under the rolls. A pressure of the treadle starts the press, and the stock is then automatically advanced to its proper position by means of the rolls *H H*. The plunger which carries both the blanking and the forming die descends, blanks out a tag; the lateral feed *D* carries the cut blank under the forming die, where it is operated upon by the next stroke of the press, while a second blank is being cut by the first die, and so on, as is customary in all regular double-die work. The roll feed *E E* is for carrying away the scrap, and also for keeping the proper tension upon the strip. *F* shows a strip of the stock after the blanks have been cut from it, and at *G* are a couple of the finished tags, although they are too small to be clearly distinguished. The press, when running at normal speed, will make a tag every second, or 3,600 per hour. The weight of the press is about 700 pounds. It is built by E. W. Bliss Company, Brooklyn, N. Y.

A Meeting of the Institution of Mechanical Engineers in London.

EDITORIAL CORRESPONDENCE.

Since the date of my last letter from Paris a number of members of the American Society of Mechanical Engineers have gone over to London to attend what is called a "Summer Meeting" of the Institution of Mechanical Engineers, although it was held (this year at least) in what we are accustomed to regard as a spring month, the date being the 27th to 29th of June inclusive. The members of the institution had extended a very cordial and pressing invitation to their American professional brethren to be present, and it is a pity that a greater number of them could not have accepted, for it is hard to imagine how an affair of the kind could have been made more pleasant.

In the first place, the Institution of Mechanical Engineers is splendidly housed in its new building at Storey's Gate, St. James' Park, Westminster. The institution is fifty-three years old, but its building is less than three years old. The preceding fifty years of thriving existence had enabled a fund to be accumulated that permitted the erection of a fine and good

building upon an ideal site, and it is doubtful if any similar professional organization anywhere in the world is as well located and housed. The windows at the front of the building look out into St. James' Park, and the view from them is morally certain never to be cut off or interfered with. The location is convenient to the government offices, not far from the Houses of Parliament and the Thames, and, in fact, is ideal, while the building itself is not only splendid, but also admirably designed for the purpose for which it is intended. The auditorium is provided with a platform, from which the papers are read, and to which all those who take part in the discussions are invited to ascend, and it seems to be the custom for all the members of the council and other officers of the society who may be present to sit upon this platform during a session, as does also the member who, having presented his paper, listens to the discussion upon it and makes final reply. The floor of the auditorium is fitted up somewhat in amphitheatre form by a series of platforms of varying hights, with suitable steps for the aisles, and these are all so arranged that when the room is to be used for another purpose the floor is readily made level.

INVITATIONS ARE PERSONAL.

One of the features of the meeting that seemed in strong contrast to the practice of the American society is the fact that the invitations and privileges of the meeting are personal and are not transferable. On going into the building, porters at the door require a ticket of admission, and proper cards of invitation are issued for the excursions and social functions, which cards are expected to be presented on the occasions to which they pertain, and it is clearly announced that such cards and invitations are issued to the person receiving them, and are not transferable.

I do not know how this would work in our American society, where things are run upon an entirely different basis. Perhaps it would not work well, but it certainly has its advantages, and would tend toward the abatement of some abuses that have crept into the New York meetings of our own society, notably the overcrowding of the professional sessions, largely by people who are not members of the society and have no special business there, but go because some friend tells them to "come along; it's all free and no tickets are required." While the custom at the London meeting is different, and some might not like it so well, it has its manifest advantages, and I suspect is an outgrowth of experience in conducting such meetings, and that perhaps when we have had an equal number of years of experience we shall see the propriety of similar restrictions—in fact, there are some who see it now.

THE ANNUAL DINNER.

The first social function in connection with the meeting was the annual dinner of the institution, which was held in the grand hall of the Hotel Cecil the evening of the 27th, and for which about 550 plates were laid. This was certainly a remarkably well conducted affair. Instead of being practically free for all and no questions asked, tickets of invitation that had been issued were required to be shown, and as each guest entered the reception room he was given a large printed plan of the dining room, on which the tables were divided into sections designated by the letters of the alphabet. An alphabetical list of the guests printed at the bottom enabled one to readily find the section to which he had been assigned, and looking in that section on the plan he would find his name printed opposite his place at the table. When the time came to march to the dining hall there was no confusion; each man knew the location of his plate and how to go there, and he also had the means of knowing just who his neighbors were.

After the usual toasts to the Queen and the rest of the royal family which preceded the dinner, there followed other toasts, among which was one to "Her Majesty's Forces," to which in responding Rear Admiral A. K. Wilson, C. B., V. C., Controller of the Navy, took occasion to say many pleasant things regarding the work of engineers who design naval vessels, their armament and equipment; but the palpable hit of the evening was made by the American Ambassador, Joseph H. Choate, who, besides recounting some of the early and later triumphs of engineers, touched upon the manifest duty and advantage of citizens of both the great English-speaking countries doing all that is possible to promote a thorough understanding and feeling of good fellowship between them. No sentiment expressed during the evening was quite so heartily responded to both by the Americans present and their hosts.

At intervals during the evening there was some excellent music by vocal artistes and finally a good deal of very pleasant and much enjoyed visiting among those who found the names and locations of friends on the printed diagram, and seized the opportunity of renewing old or making new acquaintances.

EXCURSIONS.

For the afternoons excursions to various points were planned, and members were required to designate beforehand which of these excursions they elected to accompany, and provision was made accordingly. For instance, taking Friday afternoon, the 29th, as a sample, there were four alternative excursions for that afternoon: (A) Down the Thames to Southend by steamer and round the Nore lightship, with luncheon on board. In this each member might be accompanied by a lady. (B) Down the river to several engineering works. (C) Excursion by train to Rugby to visit the works of Messrs. Willans & Robinson. This was limited to 150, and the invitation did not include ladies. (D) A visit to the Staines Reservoirs, the inlet works and the pumping stations at Hampton, luncheon at the works being provided by the invitation of Messrs. Walter Hunter and R. E. Middleton and Messrs. Aird & Sons. On this excursion each member might be accompanied by a lady, but the total number joining the excursion was limited to 100.

Of the above named excursions that to the works of Messrs. Willans & Robinson seemed most popular, and there were applications for tickets for it long after the maximum number of invitations had been reached; all the visiting Americans who desired to go were, however, provided for I believe, and as I naturally could not attend more than one excursion taking place at the same time, and chose the one to the Willans & Robinson shops, that is the only one I can give an account of from personal experience, although I am told by those who attended the others that all were exceedingly enjoyable affairs.

Two trains on the London & North Western Railway took the members from the Euston Station in London to Rugby, the first leaving at 11.35 A. M., the second at 11.50. Bearing on the feature of the meeting to which I have alluded, each guest had been previously provided with a small book giving a description of the main features of the works and having printed prominently upon its cover the words "Not transferable" and "This invitation should be produced at the works." The name of the person invited had been written across the cover, each book was numbered in series, and contained as one of its leaves the required coupons for the train "guards" and dining-car attendants. Thus does the Britisher make you feel all the more honored and appreciative of his invitations to such functions by making it clear that it is you, yourself, personally, who is invited, and that the invitation is distinctly not thrown broadcast for anyone to accept that may happen to feel so inclined.

The trains referred to were in the best style of the London & North Western road, which is saying much. Most of the cars were new diners, lighted by electricity, and with all the other latest improvements. The seats very much resemble those in our Pullman cars, only they are for one person instead of two, and the backs extend to a hight sufficient to give to the two persons who sit *vis-a-vis* at each table that privacy which is so dear to the heart of the traveling Englishman, although, of course, not particularly desired on an occasion such as this. With considerable experience of dining cars in America on most of our best roads, I do not remember that I have taken a meal in one of them that was as steady as the one in which I rode to Rugby and back, seated opposite a mechanical official of a railway in India, who gave me a very interesting ac-

count of how work is carried on in India, and of how one who tries to get along there is hampered by the customs of the service which have grown up gradually, and for which no one can be said to be now responsible, but which, nevertheless, in time reduce men either to the condition of utter despair and absolute indifference to everything except the flight of time, or to a determination to get out of the country and go where an ambitious man can at least have some little chance of being allowed to accomplish something. He told me that in one of his official reports bearing upon a previous requisition for some tools he had said that while his original recommendation had been so and so, in the meantime practice in such work, as in all mechanical matters, had been advancing rapidly, and that it could not therefore be assumed that he, as an engineer, would at the present time endorse his former statement of the case or his own requisition.

The country between London and Rugby is more like a continuous park than like a farming country such as we are accustomed to, and is exceedingly beautiful. By the time the luncheon had been discussed the train had arrived at the works, where more of the order and system with which such things are carried on here was witnessed. All the visitors passed through a small gate as they happened to come along, passing as they did so under and between the British and the American flags that formed an archway over it. As the visitors passed through the gate each was given a card explaining the system by which the visit of inspection over the works was to be managed and having attached to its face a small piece of silk of a certain color, with directions to follow the flag of the same color. Each time that the number of guests that were to form a given group (probably about twenty) had passed through the gate, a new boy having a flag of a different color stepped into the line, and at the same time the cards handed out bore the corresponding color until another change took place. Thus groups of visitors that were not too large to be really shown what there was to be seen were formed without any fuss whatever, and each visitor had in his hand a card which, whenever he chose to consult it, told him what flag to follow. There was at least one competent guide with each party, and each pursued a different route, so that there was little interference, although it was noticeable that when two parties did come together, as sometimes happened, they separated themselves automatically and moved on as before, all finally gathering at the offices of the works, where there was music (consisting of American pieces mainly) by the works band, and some little speech making, after which tea was served in the works mess room, and during the return journey by the same trains an elaborate dinner was served, London being reached at 7.15 and 7.35 P. M.

I will leave until a future time a description of some of the things seen in these most notable works, which are in many respects quite unique and very much in advance of the ordinary engine building establishment. In fact, it is safe to say that there is no other anywhere that is so far advanced in the systematic manufacture of steam engines, and a notable and significant fact pertaining to them is that there are many shops in Europe and, alas, a few in America, that are not nearly so far advanced and that could learn much from these shops, but whose doors are closed to visitors and whose proprietors would not entertain the idea of such an excursion as this to visit them; fondly imagining that they possess secrets of shop practice that it won't do to let other people know about.

In a little talk which Mr. Robinson made, after repeated calls, he remarked that thanks were due from him and his company for the attendance of the British and American societies; not contrariwise, as had been declared by a previous speaker in moving a vote of thanks to him, and he regretted that more American members had not been able to attend. He took an honest pride in what had been done, and was being done, and was glad to be able to show to his American friends what could be accomplished in Old England in the way of systematic and interchangeable manufacture when put to it. He believed that the way to develop what was best in a true Britisher was to put him on his mettle by strong competition; he showed to best advantage when things began to look dubious or even desperate, and he thought that with all due regard for the many good things that had been and were being introduced into British workshops by Americans, the best effect of these things would be found in the stimulus which they would supply and the incentive to advance in methods in British workshops. Capt. Sankey, an active director of the company, also responded to a call, and spoke of his belief that, while such business rivalries as now existed between the tool builders of America and Great Britain might occasionally arise, they would do no harm, but good instead, and that it was to be remembered that to the two great races was apparently intrusted the work of leading on the civilization of the world.

The special trains to and from Rugby were drawn by two of the latest locomotives turned out at the Crewe works of the London & North Western Railway. They are four-cylinder compounds, having two low-pressure cylinders inside and two high-pressure cylinders outside, the former being 20¼ inches in diameter and the latter 15 inches, all 24 inches stroke. There are four driving wheels, coupled outside, the same as our American engines, the machines resembling the American simple or two-cylinder compounds very much in general appearance. The driving wheels are 7 feet 1 inch in diameter; there is a radial truck forward, and the boiler, the shell of which is 4 feet 2⅞ inches in diameter, supplies steam at 200 pounds per square inch. The engines weigh complete, exclusive of tender, 54 tons 8 cwt., or 121,856 pounds, and were examined by the passengers with much interest and admired as splendid examples of locomotive construction. They, however, did no remarkably fast running on the trip, probably because it was intended to give sufficient time for the luncheon and dinner to be properly served during the run.

THE CONVERSAZIONE.

The social features of the meeting closed with a conversazione, which was held at the institution building, and on which occasion the building particularly showed its admirable adaptability to the purposes for which it was erected. Mr. James Mansbergh, president-elect of the Inst. C. E., exhibited and briefly described a number of lantern slides showing the principal features of the new waterworks for Birmingham, and in other various rooms of the building there were instrumental and vocal music rendered by professional artistes, refreshments galore and an exhibition of electrophones in the secretary's office, the whole affair passing off very pleasantly.

This was the only function of the meeting to which all the members with their wives and lady friends were invited.

A PAPER ON AUTOCARS.

Among the professional papers presented at the meeting that by Prof. H. S. Hele-Shaw on "Road Locomotion" seemed to elicit most interest and discussion. What may be called the principal portion of this paper had been presented at the preceding (April) meeting of the institution, and the portion presented at the "summer" meeting related in minute detail the experience gained with sixty-five motor vehicles which competed in a 1,000 mile trial run extending over a period of time from April 23 to May 12. Of these vehicles none was electric and two were steam driven; all the rest were propelled by internal combustion motors. Prof. Hele-Shaw is himself the owner of a self-propelled carriage, and has manifestly given considerable study to their construction and operation, his paper being a thoroughly good and practical one.

He starts out by stating that "There are strong reasons for thinking that the subject of mechanical propulsion upon common roads has now reached a point when it deserves the very careful consideration of mechanical engineers." For more than twenty years previous to 1896 there was in force in England what was known as the "Man with the Red Flag" act, which was passed as a result of the successful introduction of motor carriages into France, and which required that such a road vehicle should be preceded by a man carrying a red flag as a warning of the

danger to follow, and, of course, effectually limiting the speed to about 4 miles per hour. Since the annulment of this law the way has been more open for the development and use of motor vehicles, although there seem still to be some restrictions that must be removed before this industry can be placed upon an equal footing with similar ones in France and the United States, and Prof. Hele-Shaw and others expressed the hope that the institution would earnestly take up the work of securing the repeal of the uselessly restrictive legislation which now hampered development. Referring to the statement that "Our iron roads are the arteries and veins of the nation," Prof. Hele-Shaw pursued the analogy further, and said that "the capillaries and smaller blood vessels are in their way just as important as the larger veins," and that "there is still much room in present modes of collecting and distributing goods for improvements which would materially benefit the trade and commerce of the country." "Railways," he said, "are undoubtedly the cheapest system of land carriage for long distances, but there is a minimum distance below which the disproportion between haulage and terminal charges operates to their detriment. . . . It must be obvious that a motor vehicle, which can travel from any one point to any other, which absorbs the short cartages into one straightforward journey and which absolutely eliminates railway terminal charges, has a wide and promising scope for application." A curve made by plotting the terminal and conveyance charges, worked out in pence per net ton-mile, taken from the Government Blue Book of 1892, dealing with rates and charges, was exhibited and showed that "up to distances of 40 miles there is a field for a system of conveyance in the working of which terminals are not incurred."

The paper strongly insists upon the recognition of the fact that the locomotive running upon iron rails affords practically no experience that can be made use of in the construction of road vehicles, because the conditions being so entirely different afford practically no common ground upon which to base conclusions. From the data of Telford and Babbage it would appear as if a soft road involved greater resistance than an irregular one, "but the truth is that when considering a motor vehicle the opposite is the case, for while the amount of the resistance due to softness of the road remains practically the same as the speed is increased, the resistance due to obstacles which cause shocks and vibrations rises rapidly with increasing speed."

Speaking of tires, the author says that "More than fifty years ago a brougham was running in London with pneumatic tires, which were the invention of an engineer, Mr. R. W. Thomson. This invention did not attain a practical success at the time because the mechanical appliances and materials available at that time did not enable the inventor to successfully cope with the practical difficulties in the way of its commercial construction."

The following conclusions derived from experiments made in France are given:

(1) The force required for the pneumatic tire increases very little from walking to trotting, while that absorbed by an iron tire perceptibly increases with the speed.

(2) The advantage of the pneumatic over the iron tire increases rapidly as the speed increases. Taking 100 as the force required for the pneumatic tire and iron tire at a slow speed, the resistance of the iron tire increased at an ordinary trot to 126, and at a quick trot to 164, and probably if the matter had been investigated for the ordinary speeds of an autocar, the relative resistance of the iron tire would have been found to rise even more rapidly.

(3) The solid india rubber tire is better than the iron-tired wheel in certain cases, especially at the trot, if the surface be sticky, very irregular, or covered with snow; but it becomes inferior to iron if the surface be hard and smooth. It never gives a much better result than the iron tire, and it always remains vastly inferior to the pneumatic. On the other hand, the pneumatic is 50 per cent. better than the iron tire.

Regarding steering mechanism, it is stated that "the great majority of motor vehicles are steered upon the principle which was invented by Ackermann in 1818, the leading feature of which, as stated by him, being that the vehicle 'will turn within a small compass and with safety, because the wheels do not materially alter their bearing upon the ground when they are placed in the greatest degree of obliquity.' The essential principle of the Ackermann system consists in replacing the pivoted fore carriage of an ordinary vehicle which has one axle for the two wheels, by two short pivoted axles, each carrying one of the steering wheels. The conditions of correct running of the wheels are that when they are turned their normals intersect on a point on the line of the axle of the driving wheels." Diagrams are given showing the construction and the geometry of the idea.

The paper then describes the main features of the motors most employed, and regarding electric motors says: "So long as a range of 40 miles per charge, at speeds not exceeding 10 miles per hour, meets the requirements of an automobilist, electricity, at a cost of not more than 2d. per B. T. U. is at least on a par with steam or oil, even for heavy traffic. Where these limits are exceeded, electricity is inadmissable. Distances greater than 40 miles, and speeds greater than 10 miles an hour, involve prohibitive dead weight and excessive discharge rates." Speaking of some trials of electric driven carriages in France, wherein the utmost attainable speed seems to have been the object sought, the author says: "The extraordinary nature of these results lies not so much in the fact of a high speed of 65 miles an hour by a motor vehicle, but in the fact that, starting from rest, the average speed for the first kilometer was 46½ miles an hour. . . . There is little doubt that these results could be beaten if the consequent expense were to be faced, but, according to report, the batteries were themselves practically destroyed in the run, and at any rate the contesting vehicles were not only towed out to the scene of the trial, but towed home again afterwards."

For transmission of power from motor to wheels the author declares that chain gearing has been developed from the crude device it was a few years ago until it is now "as efficient, if not more so, than any other mode of transmitting power. . . . The Renold chain, which is largely used in heavy motor traffic, is a beautiful invention, which meets in a most ingenious manner the alteration of pitch due to wear, and the latest improvements in this chain are designed to obviate as far as possible the wear upon the pin itself, and reduce it to a minimum."

The supplementary paper referred to consisted chiefly of tables and diagrams pertaining to the trial run of 1,000 miles, and showed a very favorable result indeed for nearly all the vehicles; there were certainly no greater number of breakdowns or failures than would naturally be expected in a trial of almost any similar number of newly developed machines of any kind, and one of the machines that failed was a steam driven one, which broke a cylinder head, but proceeded back to London under steam.

When the discussion that followed showed a tendency to wander it was noticeable that the chairman requested members to confine their remarks to the subject of the paper, and a curious feature of the debate was the fact that at least one member was present who, as an owner of horses, distinctly favored the idea that roads were made for horses, and that those who proposed to use any other sort of vehicle upon them should be compelled by law to conform to such regulations as the idiosyncrasies of the horse would seem to call for, an idea which was vigorously, but with perfect good nature, opposed by many other members.

GUN MAKING UNDER DIFFICULTIES.

Another paper described in detail the shop methods followed in the construction of 4.1-inch rifled, breech-loading gun in the workshops of the De Beers Consolidated Mines, in Kimberley, South Africa, during the recent siege of that place. There being no gun in Kimberley capable of effectively replying to the guns used by the Boers, the late Mr. George Labram, chief engineer of the company, undertook to construct one out of a mild steel billet (intended for shafting), 10½ inches in diameter, 10 feet long, and several bars

of 6x2½-inch Lowmoor iron, out of which latter the rings were made by forging. Mr. Labram was killed shortly before the relief of Kimberley, and the paper was written by the chief draftsman, who assisted him in the work, Mr. Edward Goffe, an associate member of the institution. The author says that the first difficulty met with "was the resistance of the military authorities to the attempt to make the gun," and it is probable that if the full story of this feature of the work could be told it would prove very interesting. Finally, however, permission was given, and with the materials named, working in workshops that were constantly under shell fire from the enemy, the gun and its carriage were made and put in action within a period of twenty-eight days, and did excellent service, the ammunition having also, of course, to be made within the works. The builders had for their guidance the articles on gunnery in the "Encyclopædia Britannica," a military "Treatise on Ammunition," articles on "Modern Guns" in "Engineering," and a military "Text-Book on Gunnery," besides which there happened to be in the workshops several mechanics who had previously been employed at Woolwich Arsenal, and who were able to recall and give information respecting the tools and special appliances employed there. In all, 255 shells were fired by the gun while in action, most of them being at ranges of 5,000 to 6,000 yards, and the author refers to the manifest surprise and consternation of the besiegers when the first shells exploded in their headquarters, which had been supposed to be entirely out of range, as in fact they were so far as any gun in Kimberley was concerned previous to the completion of this one, known as "Long Cecil." As an example of what may be accomplished by competent men determined to succeed, under adverse circumstances, the paper is an exceedingly interesting one.

RECENT LOCOMOTIVE PRACTICE IN FRANCE.

M. Edouard Sauvage, a French member of the institution and holding the position of assistant engineer-in-chief, rolling stock and running department, Western Railway of France, presented a paper on "Recent Locomotive Practice in France," which paper was devoted almost entirely to a presentation of the advantages that experience had shown were possessed by the modern four-cylinder compound locomotives, of which the author said there were to-day in France more than 800 of this kind in service or under construction; the four cylinders driving either two, three or four axles, and with varying sizes of wheels, depending upon the kind of traffic they are intended for. The engines referred to have the two low-pressure cylinders inside the frames and the two high-pressure ones outside, and the author declares that nothing but good results have been given by them. They save enough fuel to at least offset their heavier first cost, while the repairs do not cost more than for the simple engines, for the reason that although there are, it is true, more cylinders, valves and bearings to maintain, the work is easier on them and the wear and detoriation less rapid. Even the expense for oiling is not, he declares, increased, and the men on the road prefer these engines to the older simple ones. He speaks of the elevation of the boilers above the track to a center distance of 8 feet 2 7-16 inches, and naively adds that "if there still exists a divergence of opinion in this matter it is between those who think that there is no disturbance in the stability and those who think that there is a distinct advantage in this respect."

Bogies, he says, are now the rule, especially for high-speed locomotives, and many of the old simple locomotives have been supplied with them, while no new road machines are now made in France without them.

In the course of the paper the author refers to some simple engines on the Etat road that have what is called Bonnefond valve gear, "each cylinder having four valves, two for exhaust and two for admission. The latter are disposed for rapid closing by the action of a click. It is interesting to note this application of the Corliss system to locomotives. The results appear to be satisfactory in practice, but up to the present it does not seem likely that the system will receive any considerable extension."

Next week the American engineers, civil and mechanical, are to be the guests of the Institute of Civil Engineers, and among the other attractions there will be a visit to Windsor Castle, where it is expected there will be an opportunity for at least a glimpse of the Queen, and after that as many as can do so will go to Paris together, and from there to Berlin as the guests of Ldw. Loewe & Co., who will provide a special train from Paris to Berlin, and will see to it that time does not drag heavily upon the hands of their visitors while in the city. F. J. M.

London, June 30.

A Foundry Foreman's Experiences.*

That "it takes all sorts of people to make a world" is an old saying, and I know of no better place to see this adage in its true light than in a foundry. Watch a molder for an hour and you can not only form a pretty clear idea of his ability as a mechanic but also of his character, for to an observing person the slightest actions are an index. Have you ever had a man approach you in this manner: "Say, boss, can you gimme a job? I'm an all-around good molder; heavy or light, bench or floor. Have just landed in town and would like to get to work." You put him to work and watch him for a while. Without doubt, you will see him work away with his sleeves dangling over his hands, and his floor will in a short time look like a mud road on a rainy day. His shovel will have an inch of sand clinging to it, and rather than clean the blade he will plow through the sand heap, using twice the necessary strength. His mold will be on top of 6 or 8 inches of sand, instead of down on the proper level of the foundry floor. The partings of the mold will look as if rats had been digging holes in them, and you may look for a goodly percentage of his castings in the scrap heap. Then, again, you are confronted with the man who believes he can give you eminent satisfaction, and is perfectly willing to have you judge his ability after giving him a fair trial. You may not see his rammer flying up and down like the piston rod of an upright engine at full speed; on the contrary, every stroke is gaged and is aimed at the right spot. He will clean up around his mold after "lifting off," and the edges and corners of his mold will be sharp and neat. It will hardly be necessary for you to see his castings before putting him down as a good man to "tie to."

Then there is the piece worker who will complain loudly when he is given an unaccustomed job. But when informed that, owing to the absence of the man to whom the work is usually allotted he has been selected, he will be appeased and will work the harder and better, just to show you that he can.

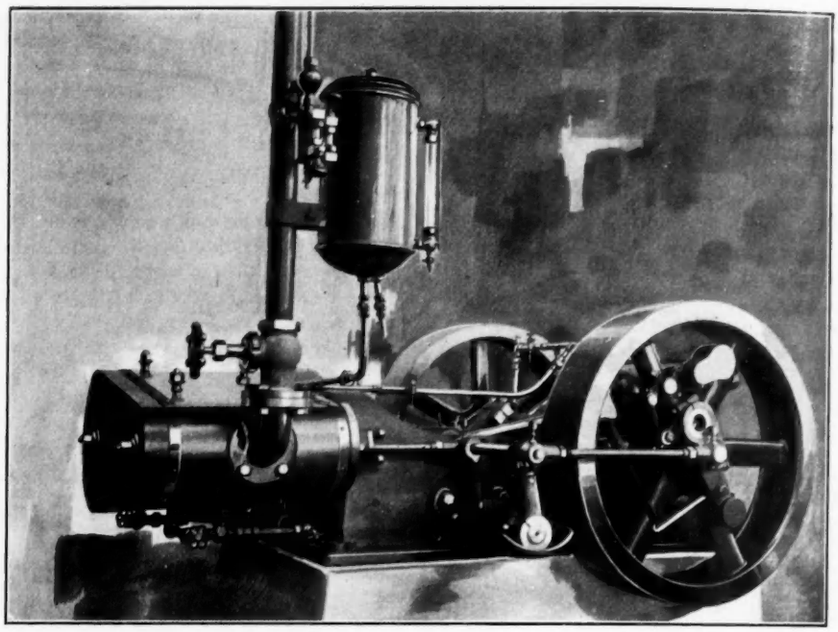
If you catch one of the boys hitting another in the ear with the blacking bag, do not send him to the office for his money, but tell him to go to the "gagger board and make two barrowfuls during the heat;" see that he does so, and the next time he desires to have any sport he will take good care that the foreman is not handy. A boy may come to you with tears in his eyes, worked up and nervous over some misfortune to his mold, and will want to quit. Instead of letting him carry out his determination, after he cools off show him his mistake, so that he will know better the next time, and in the end he may turn out to be a valuable hand. So it is with the core-maker, cupola tender, chipper and laborer. Of course, you will find the "beat," and when you do lose no time in discharging him. In the end, there is no iron-clad rule for governing a lot of men to secure the best results. For, after all, what are men but grown-up children, all having peculiarities and eccentricities and, as Burns would say, "A mon's a mon for a' that." I repeat that the foundry is a good place for the study of human nature.

*Benjamin D. Fuller, at meeting of Pittsburgh Foundrymen's Association.

The French Minister of the Marine, by way of experiment, has given an order to the Forges et Chantiers de la Méditerranée for a 90-ton torpedo boat with turbine engines. The construction will be actively pushed along in the shops of this company, at Graville, near Havre.

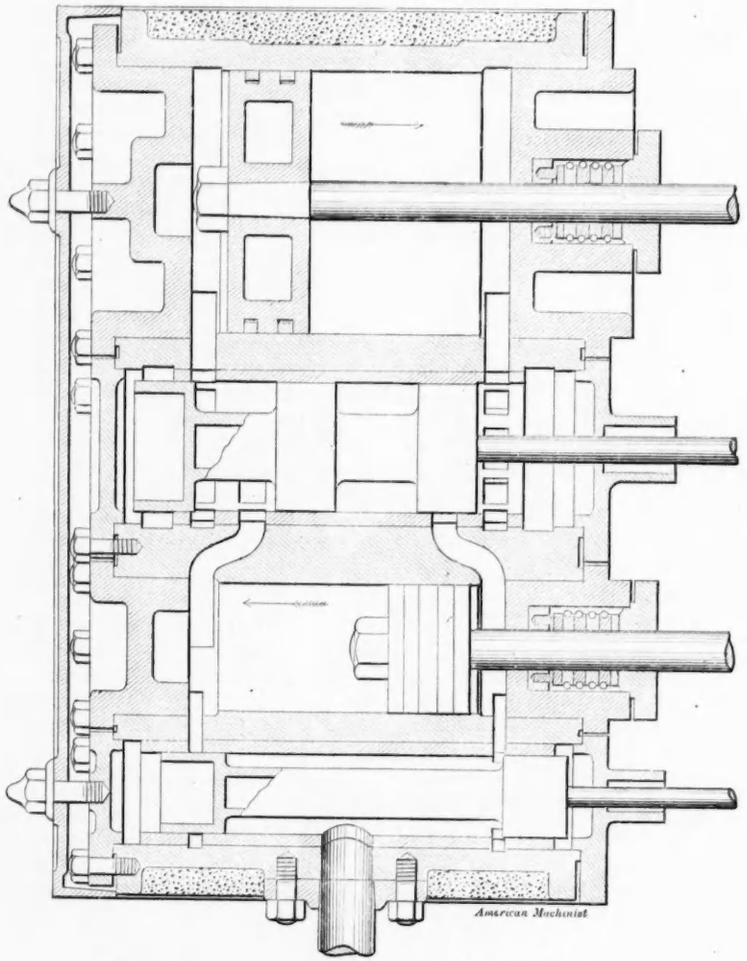
An Automatic Cross Compound Steam Engine.

The half-tone, Fig. 1, shows a 100 horse-power automatic cross-compound steam engine having some novel features. Fig. 2 shows the arrangement of the cylinders and valves. The cranks of the engine are 180 degrees apart, so that the movement of one piston is always in the opposite direction to that of the other. As will be seen, two piston valves are used for directing the movements of the steam. The first valve has to do with nothing but the admission of the steam to the high-pressure cylinder. This valve is moved by an eccentric controlled by a flywheel governor of familiar type, which allows the steam to follow the piston for any portion of the stroke that may be required, according to the work. The valve between the cylinders is operated by a fixed eccentric and controls the exhaust of both cylinders and the admission to the second cylinder. By this arrangement the same compression is always secured in the high-pressure cylinder, no matter what may be the point of cut-off. Although two valves are here used where one is sometimes made to do the work, it will be seen that the result is simplicity and compactness. The shortness and directness of all the steam passages are especially noticeable.



REEVES AUTOMATIC CROSS-COMPOUND STEAM ENGINE.

The oil tank attached to the steam pipe contains a supply of lubricating oil for the main bearings, slides, connecting rods and other parts not subject to steam pressure. There is no pressure behind the stuffing box of the high-pressure valve-rod, and only a light pressure for the main valve-rod, so that there is little wear to the rods. This engine is built by the Reeves Machine Company, Trenton, N. J.



ARRANGEMENT OF VALVES, REEVES COMPOUND ENGINE.

Tungsten.

There has lately been some revival in the production of tungsten and some increase in its use, although it must still be classed among the rare metals. The price of the metal, which is associated with tin in Cornwall, England, is now about $300 per ton, while in 1892 the average price at the mine was about $100 per ton, although in a former year the price had very nearly touched $1,000. Steel makers more than twenty years ago discovered the value of tungsten for imparting toughness. Mushet steel is a tungsten steel. Steel may contain a much larger proportion of tungsten than it can of carbon without losing its power of being forged. The methods of using the tungsten in steel manufacture is still more or less a trade secret. Siderophite is an alloy containing a large percentage of iron, with some nickel, aluminum and copper and 4 per cent. of tungsten. It is said to resemble silver, is very ductile and malleable, and also not easily affected by acids. Tungstate of soda is used to some extent, but hardly increasingly so, in the textile industries.

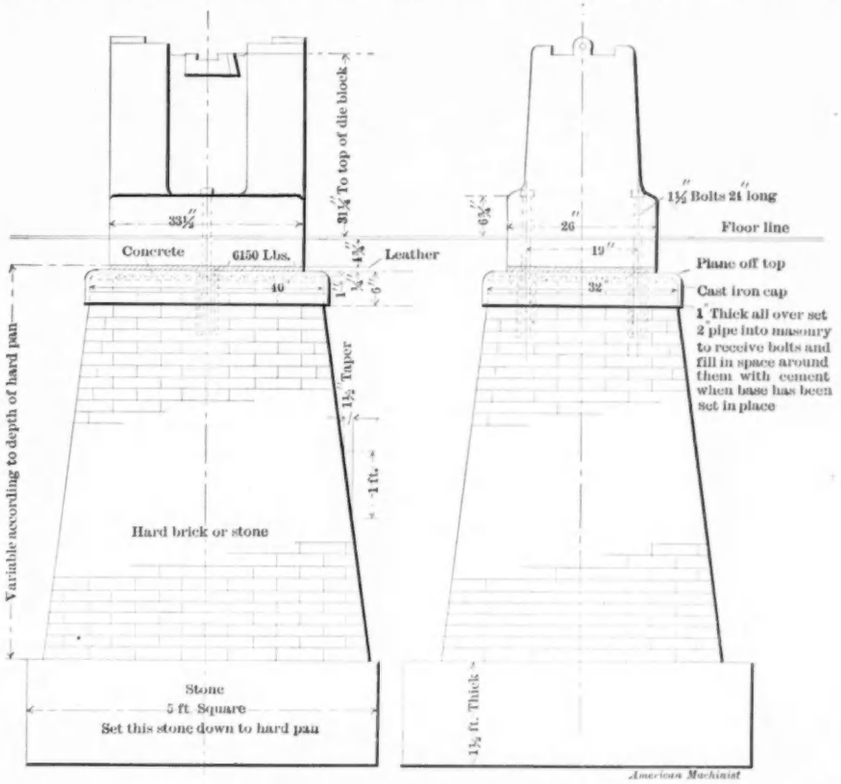
The Clyde returns show that there is something like a slump in the new orders for tonnage. During June orders were placed on the Clyde for only 600 tons of new shipping, against 30,000 tons in January, 1,500 tons in February, 15,000 tons in March, 25,000 tons in April and 22,000 tons in May. In June there were launched twenty-seven vessels, of 48,800 tons.

Foundations for Drop Hammers.

One of the most perplexing problems of the mechanical engineer is the securing of satisfactory foundations for large hammers, whether steam hammers or drop hammers. Numerous experiments have been tried with both elastic or yielding foundations and with those in which every precaution has been taken to make them as solid as possible. The builders of drop hammers quite naturally have accumulated experience of their own in this line, and must be assumed to know most of what is attainable on the subject.

We present herewith a standard drawing of a drop hammer foundation of the Pratt & Whitney Company. They say: "We do not advocate much woodwork under these hammers, but would advise building a foundation of concrete or square block of stone or cast iron, bedded down to hard bottom. This is quite a departure from the usual way of setting a hammer, but it has been found to be much better, more effective and less liable to breakage than with a wood foundation. All the cushioning necessary with this foundation is about one layer of leather under the bed-piece. Too much attention cannot be paid to the foundations of drop hammers. In all cases excavate to hard bottom, or, better still, to rock." This information therefore seems to be of little use where neither the hard bottom nor the rock is to be found.

The drawing shows a foundation built up of hard brick. Of course large stone masonry is much better, but a cast-iron box set into the ground and filled with Portland cement is best. The solid stone masonry is used by the Gorham Silver Plate Company, Providence, R. I. They have drop hammers of 3,000 pounds weight of ram working on these foundations.



FOUNDATION FOR DROP HAMMER.

Tools and Tool Steel in India.

No one can understand India from an industrial point of view who does not know the ideas of the native workman on the subject of tool steel. There are hundreds of thousands of workmen who use cutting tools, who never in their whole lives handled a first-class cutting instrument—never saw a bar of the best tool steel, and who know nothing better than the material of old files, railway spring plates and cotton spinning spindles. Others again, who are a little more advanced, purchase steel in short square bars that are made and imported expressly cheap for the Indian bazaar. The manufacture of first-rate steel in India is almost extinct, if not entirely so, as a native industry, and scrap steel supplies the bulk of the artificers with material for their tools. The chronic aversion that the native artificer has to the purchase of tools, leads him into many foolish economies and a terrible waste of time, which can only be remedied in the course of generations. He is devoid of mechanical ingenuity, and he will not understand that greater facilities for work will increase his revenue. His knowledge of practical mechanics is almost *nil*, and he continues to use a long screwdriver with a small, badly shaped point with which he spoils every screw he touches, instead of cutting the long blade into two pieces with which he might make two screwdrivers of different sizes. This is typical of the man and the nation. Hundreds of villages are built on the Himalayas of timber without the intervention of a single gang saw, in a manner that could only be justified in the most remote corners of the world. Gang and cross-cut saws are used in the Himalayan forests to cut timber for the government, but the villager, following traditional usage, fells a tree with the axe, cuts it into lengths of 6 or 7 feet, splits these lengths into slabs with wedges, and trims them into boards with a small axe, which is also a hammer and a chisel. This involves a terrible waste of time, but the workman has not yet learnt the value of time. Such a man will not purchase a plane; he will buy a blade and fit a very inferior body to it. He will buy a saw blade and supply the handle. He will also buy one or two chisels (with a good broad shoulder), for his chisels serve the purpose of a tenon saw and often of a hand-saw. He will reduce the thickness of a board with them, cut 6-inch by 1½-inch tenons and perform other work that no other man would think of. A fiddle drill of wood with loose points takes the place of brad-awl, gimlet and hand brace; his rule is a stick with notches; and with this outfit he will build a house, a cart, a boat or a chest of drawers. It is plain that there is not very much in the ordintry ironmonger's stock that appeals to such a man. Of door and window fittings he must buy a certain number and also of wire nails, screws and hinges, but he buys nothing that he can possibly or impossibly dispense with. Still, he needs a much greater stock of tools, and must learn to use them. At the same time his ideas of economy cannot be upset all at once, and cheap steel of suitable sizes, even if the quality is inferior, offers a step in the right direction. One of the objections to file steel is the trace of the teeth on the surface of tools made from it, which ruins cutting edges. All teeth should be completely ground off before the steel is fit for use. The railway spring blades are better stuff than much of the imported steel, but the form is unhandy. There is room for a profitable small industry in Bombay for the reduction of files and spring plates to useful forms for artificers. The files should be ground smooth, a process that can only be done with economy on a steam-driven stone, and the spring plate should be rolled into cheap saw blades or divided by means of cutting rolls into suitable bars for the use of the small artificer. At the present time spring plates are actually hammered into cross-cut saws on the anvil and used by wood cutters, although the labor of working with such tools is greatly increased.

It would be much better if the Indian workmen would at once recognize the superior advantages of many European

methods and appliances, but this act lies entirely with himself, and no coercion is possible. In a railway workshop where all his tools are found for him, he is willing to learn the use of new types of tools and to benefit by their superior rapidity of action. But if he leaves the railway he is quite prepared to abandon every new thing he learned and fall back into the ranks of his less favored fellows if chance so decides. Only those who enter young into European workshops appear to cling to the better and more rapid systems of work.

The cotton mule spindle has been a very great boon to the Indian artisan. Its form suits the requirements of many tools, especially those of the carver in wood and stone. Only an approximate estimate can be made of the number of spindles thrown out per annum, but at 5 per cent. on the total in India the figure would be 315,000. To these must be added the outfit of mills that are burned. It would be impossible to state all the purposes to which the spindle is applied, but they include cutlery, surgical instruments, arms and tools innumerable. The subject suggests an addition to the usual instruction in technical schools dealing experimentally with the actual value of different qualities of steel in the form of tools.—"Indian Textile Journal."

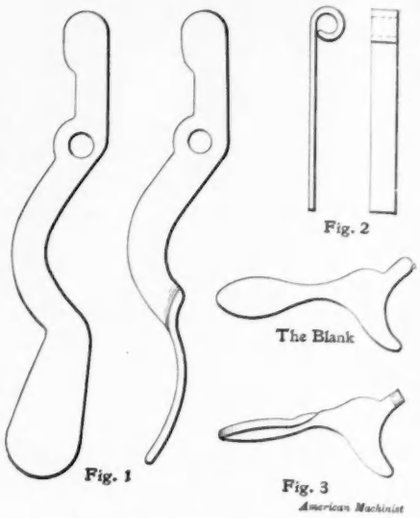
Two Forming Dies.

BY A. H. CLEAVES.

The dies described in the following article were made by Mr. P. J. Dougherty, of Brooklyn, N. Y., who says that as far as he knows they were original with him. At any rate, they do good work, and covering, as they do, a principle in die making open to frequent application, they are well worth examining.

In Figs. 1 and 3 examples of a quarter-twist for handles or levers, all in one piece with the working part are shown; and in Fig. 2 is a piece of curling done in one operation. The articles like Fig. 1 were made in pairs, the twist being right in one and left in the other, a double die being used. The die for Fig. 3 is shown in detail, and is commendable for its simplicity, cheapness and efficiency. There are no spring pads or knockouts. Fig. 4 gives a general view of the die in plan, front elevation and left elevation of the base or die, and left-hand view of the punch in the holder. *E* and *F* are a pair of steel blocks held in the casting *G* for locating and securing the piece.

Fig. 5 gives three views of the lower forming die. This is held down by the plate *H* in contact with *B* and a projection on *F* in contact at *A*. The hardened piece *C* is inserted in *F* for bending the point *I*,



SAMPLES OF WORK FOR FORMING DIES.

Fig. 3. Fig. 6 is a sketch to illustrate the principle mentioned at first, which relates to twisting the work as shown. It will be seen that a more acute angle than 45 degrees can be secured in this way. The piece is supposed to be held at points 3 and 4, and forced down at 1 and 2; and the same principle governs the shaping of Figs. 1 and 3, or anything in that line done in this way.

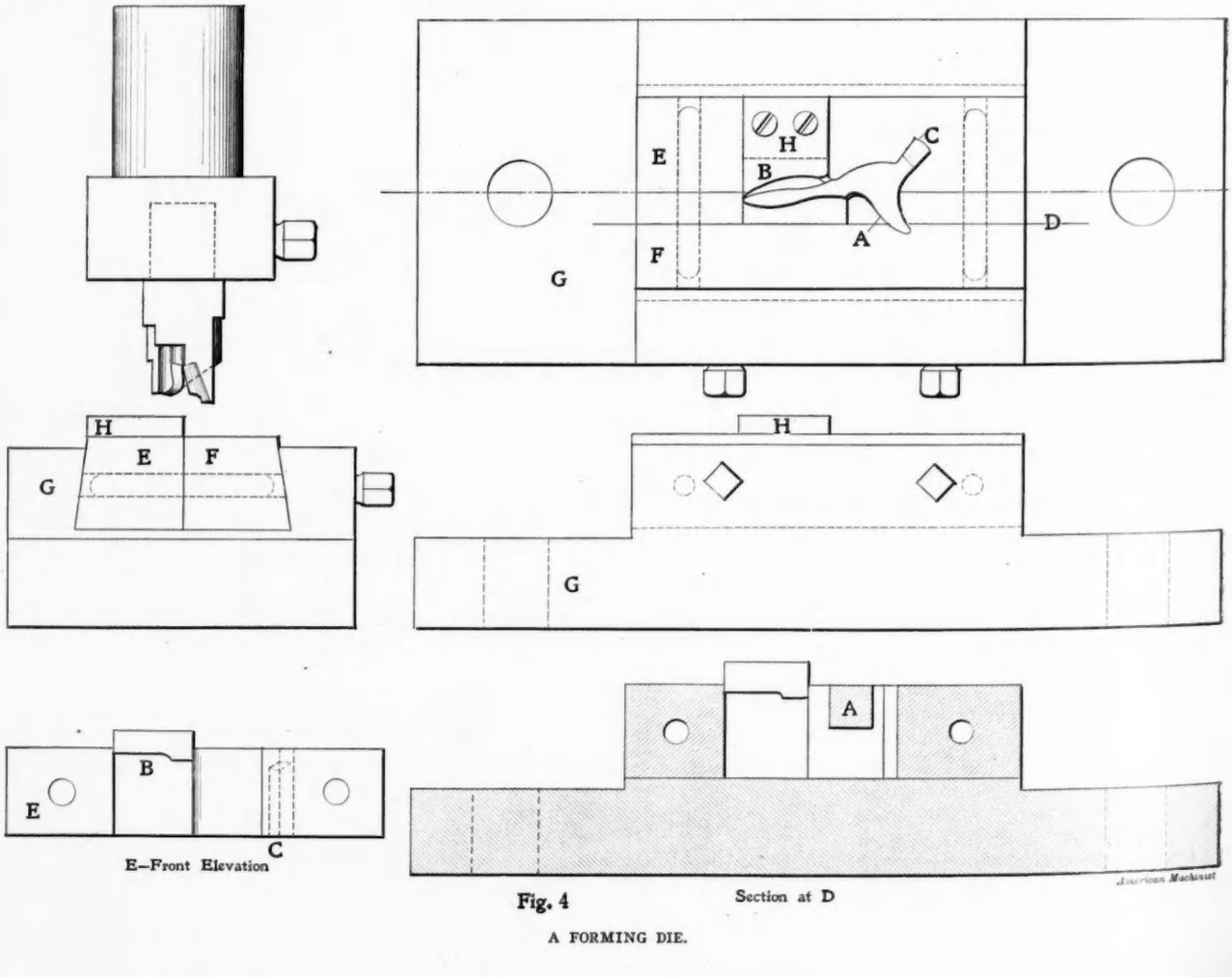


Fig. 4

A FORMING DIE.

THE CURLING DIE.

Fig. 2 is a case of curling pure and simple. While thin stock like soft steel and copper will shape up well in straight

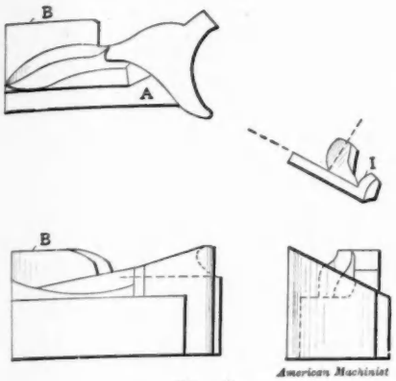


Fig. 5

or taper round dies, with a loose arbor, this piece will not. In Fig. 8, for example, the stock *K* is forced around the loose arbor *L* as *M* enters *N*, and whatever form it may take in the process, a turn of the arbor and a second blow of the press seem to give good results.

But in the case of Fig. 2, the stock being soft steel about 3-64 inch thick by ¼ inch wide, the same rule did not work. There was no chance to turn the work and strike it twice. The stock leaned over and took a short bend first, and when the metal had passed around the arbor the kinks would come out, the stock rather compressing out of shape. A perfect result was obtained by putting the arbor, Fig. 9, in the punch *A*, Fig. 10, at *O*, and

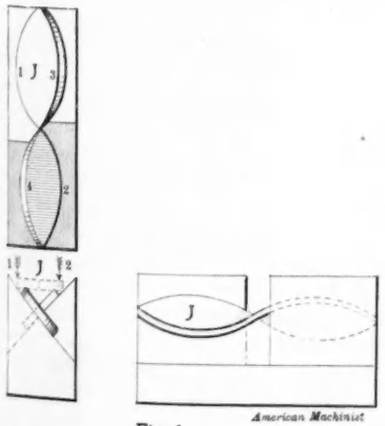


Fig. 6

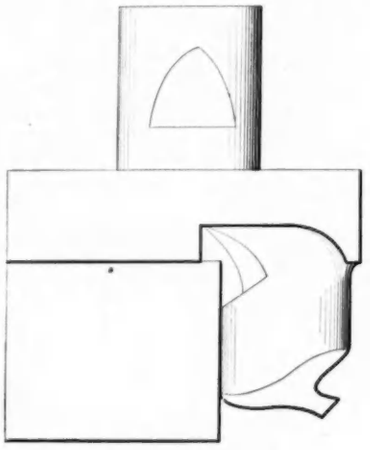
forcing the stock around it in an arbitrary path. This commenced curling the metal, and continued until finished. The eye or loop was friction tight on the arbor, as wanted. The stock is dropped into the opening or channel *P*, the die swinging out on the pin *Q* to admit it. The strip *R* pumps on a spring and goes down with the punch to keep the stock from humping. It has a pin and slot stop, and the rod *s* furnishes a stop for the die when tipping forward.

Points on the Hardening of Steel.

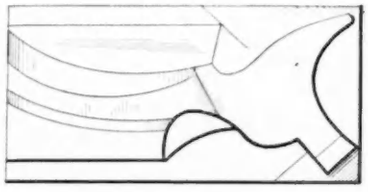
We have recently received two or three interesting questions, one of them from England, concerning the hardening and the resulting hardness of steel. The questions are here reproduced, with an answer for each, the answers being kindly supplied by Mr. J. H. Patriarche, of the Crescent Steel Company.

Q.—If I harden a piece of steel and draw it to a straw color, then polish the color off and draw it to the same color again, will it be any softer after drawing it the second time than it was after the first drawing, it being heated to the same temperature each time?

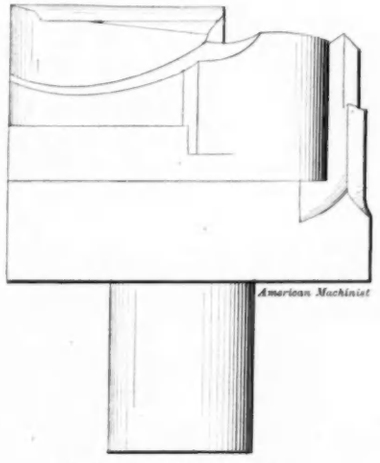
A.—The piece of steel drawn a second time after grinding off the first tempering color would be softer than it was before.



Front View of Punch



Bottom of Punch



Same inverted showing back

Fig. 7

ENLARGED VIEWS OF PUNCH.

Consideration of this matter will show that the second drawing starts on a softer piece of steel than the first one, and successive drawings would gradually leave the steel too soft for much service.

Q.—If I harden an arbor so that a file will not cut it, then grind off 10 or 12

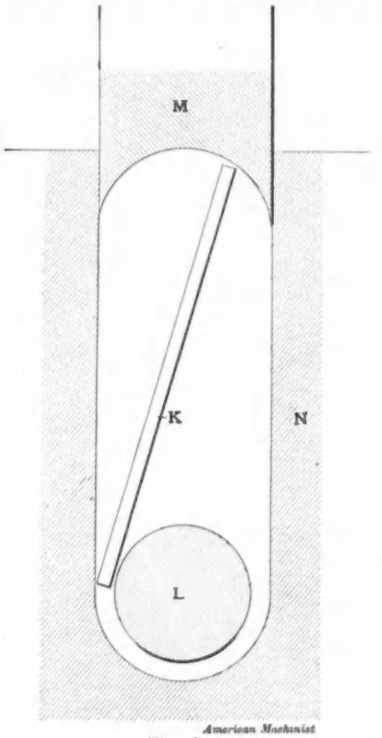


Fig. 8

A CURLING OPERATION.

thousandths of an inch, I find that it is easy to mark it with a file. I use plenty of water when grinding and take light cuts. Is there any method of hardening a piece so that it will be just as hard after reducing its diameter by grinding?

A.—From his report the arbor was only case-hardened, and it would be rather a shallow case-hardening at that. If he wants the arbor good and hard, it should

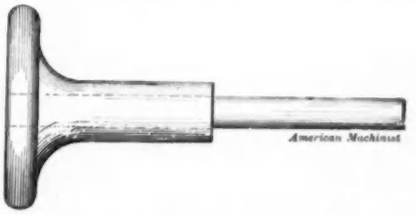


FIG. 9. THE INSERTED ARBOR.

be made of tool steel of suitable quality; then it can be hardened and drawn and tempered safely without leaving it too soft to stand a great deal of work, as, for instance, for high-speed machinery. If he desires to use a mild steel, and case-harden it, the depth of the hardening can be regulated by the time it is left in whatever stuff he uses for case-hardening; but he ought to be able to case-harden it readily, so as to permit of grinding off 10 or 12 thousandths, or even 1-64 inch, if he

wishes to, without getting into the soft stock. If tool steel is used, he must be careful to turn off a good liberal cut, for it is always more difficult to get a smooth round section hard all over than if it was in some other shape, and the surface broken up into angles.

Q.—What effect does sulphuric acid have when used for the hardening of milling cutters? For instance, I have hardened two milling cutters, one in the vitriol, and one in lukewarm water; they are the same size and shape and cut off the same bar of steel. After hardening, I have broken a bit off each. The one that was hardened in the acid had a grain as coarse as cast iron, while the one that was hardened in water had a beautiful fine grain. I have tried this several times, with the same result; what is the cause of it? Is it due to the action of the sulphur or of the oxygen in the acid?

A.—Sulphuric acid is neither a desirable nor a safe thing to harden tools of any kind in. Some toolmakers like to use a little acid in their hardening bath, but it is not a safe material to use, as, if the solution is at all strong, it is pretty certain to rot the steel, unless the hardened pieces are thoroughly washed and baked, in order to get rid of it. Of course it is well known that a weak sulphuric-acid bath is used for pickling, and it is just as well known that if the steel is allowed to remain in this bath very long it will be as effectually ruined as by any other known process. I believe those who favor a little sulphuric acid in the hardening bath do so because the pieces come out nice and clean and bright; but if your inquirer wants to get his milling cutters out in good condition, he need use nothing stronger than clear water or good, strong brine. The latter will harden his steel at a lower heat than plain water will, and to that extent is perhaps a safer fluid, as the lowest heat which will give him the required hardness in his cutter is the safest in every way. There is not as much chance of cracking, and the cutter is less likely to change in shape or size. If the cutter is going to be used on very hard metal, let him get a fine quality of high-carbon steel, anneal it carefully and slowly, and use nothing but plain water or brine, for the hardening, and let his acid bath severely alone. There is nothing to be gained by its use, and he has evidence of the disastrous results too often following its use.

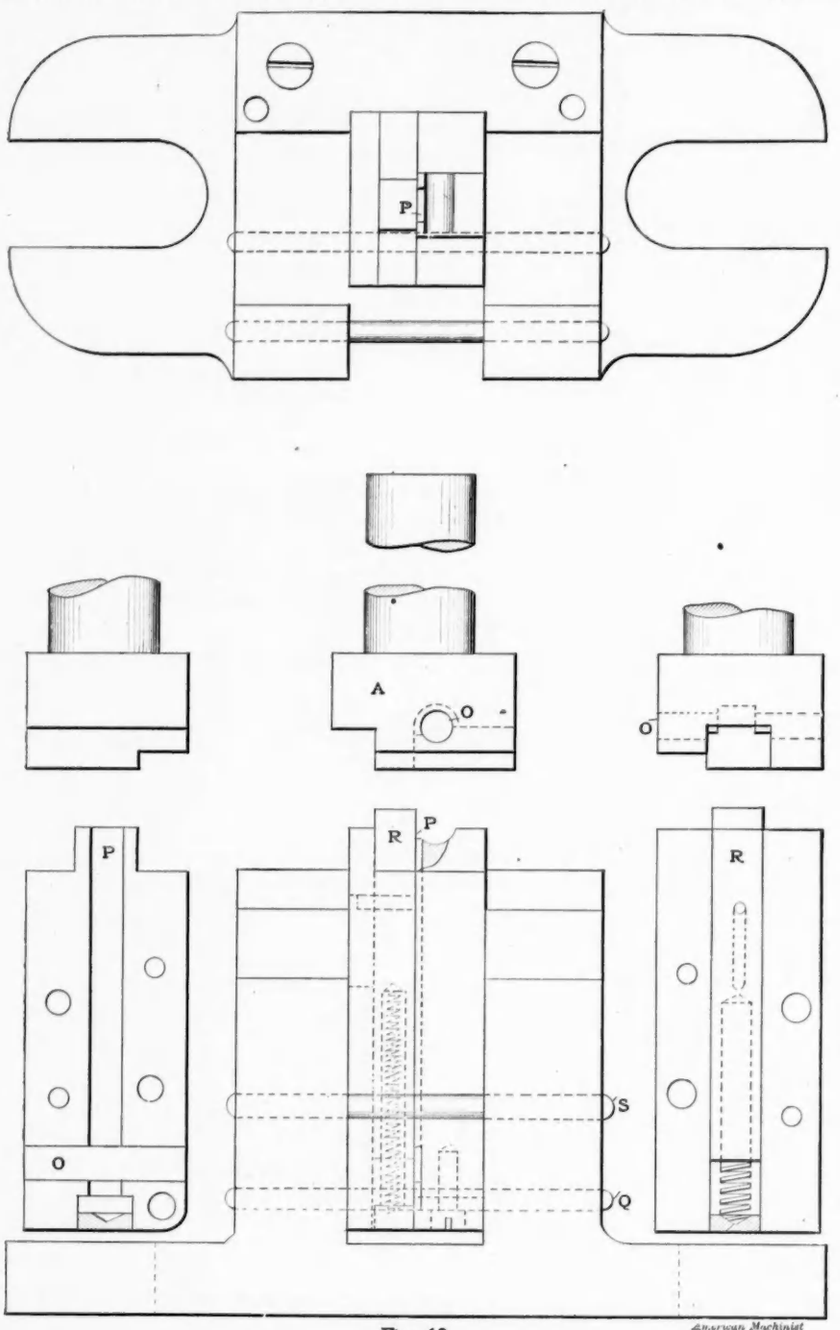


Fig. 10

A CURLING DIE.

Graphical Constructions for Finding the Center of Gravity and Moment of Inertia of Irregular Sections.*

The following methods of finding the center of gravity and moment of inertia of plane figures are given because the constructions do not seem to be as well known as they should, and because they solve problems which are not possible of solution in any other but the graphical way, except direct experiment, the latter being, however, neither so accurate nor so convenient.

The first construction is that for the center of gravity of an irregular section.

As to the value of this point it is well known to all; any question of balance involves it, and so do questions of stability and buoyancy. It must be known for all sections, subjected to bending—girder, joist or rail—and in all riveted work the rivets must, as far as possible, be arranged symmetrically about a line passing through the center of gravity of the section, angle or other shaped iron used. There are several constructions, but the one shown in the diagram is incomparably simpler and neater than any other of which the author knows. The construction is shown in Fig. 1. The problem usually takes the form of finding a line in a given direction passing through the center of gravity of a given section. Let the direction by $O\ Y$. Draw a line $O\ Y$ in this direction and touching the base of the figure. If the figure is curved at the bottom the line $O\ Y$ must be a tangent at the lowest point of the figure. Next draw an axis $O\ X$ at right angles to this. In most practical problems the section will be sym-

*From a paper, by F. H. Hummel, read before the British Civil and Mechanical Engineers' Society, with some alterations by G. A. Hutchinson.

metrical, and in this case the line $O\ X$ is naturally taken along the axis of symmetry, and the construction has then to be made for one-half of the figure only; if it is not symmetrical the axis $O\ X$ can be drawn in any convenient position, and the following construction must be applied to each side of the figure. Draw a line $M\ N$ parallel to $O\ Y$ about half-way up the figure, and at some even distance d from $O\ Y$.

Next draw a series of lines $P\ R$ parallel to $O\ Y$. In straight parts of the section, such as the web in the figure, these can be wide apart, but where the section changes rapidly, they must be drawn closer together in order that the final curve may be quite definite. At the point P, where one of these lines cuts the section, draw a line $P\ Q$ parallel to $O\ X$, intersecting $M\ N$ at Q. Join O and Q and produce to R on the line $P\ R$ originally drawn. R is a point on the curve we are finding. Repeat this for each of the series of lines and connect points R so found by a curve (dotted in the figure).

Then if the area of the original figure equals A, and the area of the new dotted figure equals G, the distance of the center of gravity from $O\ Y$ along $O\ X$ is

$$x_0 = \frac{G}{A}\ d$$

Proof—Let y equal the length of an infinitely narrow strip of width $d\ x$ at a distance x from $O\ Y$, the area of this strip being $y\ d\ x$. The area of the whole figure is the sum of these infinitesimal areas into which we may imagine it to be divided, and the mathematical expression for the area is

$$A = \Sigma y dx$$

Similarly, if u be the length of a strip of the divided figure at the distance x from $O\ Y$, we may write

$$G = \Sigma u dx$$

The distance of the center of gravity from the axis is the sum of the products of these small strips by their respective distances, all divided by the sum of their areas, or

$$x_0 = \frac{\Sigma x y dx}{\Sigma y dx}$$

From the figure we see that

$$\frac{MQ}{MO} = \frac{y}{d} = \frac{u}{x}$$

whence $x\ y = u\ d$, and

$$x_0 = \frac{\Sigma u d dx}{\Sigma y dx} = \frac{d \Sigma u dx}{\Sigma y dx}$$

or

$$x_0 = \frac{d\ G}{A}$$

If $O\ X$ is not an axis of symmetry the area G must be taken as the sum of the areas of the new curves obtained for both sides, and A must be the area of the entire section. Modifications of this construction will suggest themselves, and compared with the method of dividing the section into strips and finding the resultant of a number of forces considered as the weights or areas of the strips, the construction above will be found most expeditious.

The next construction is for determining the moment of inertia of a section. This is also of the utmost importance. The value of a section to resist bending or twisting depends upon its moment of inertia about an axis through its center of gravity. Every problem in which rotating bodies are concerned, flywheels, etc., involves its use.

The usual construction for this necessitates the finding of two centers of gravity; the one now given determines the moment of inertia as an area direct, only a planimeter being required.

Referring to Fig. 2, $O\ Y$ is the axis about which the moment of inertia is required, and $X\ O\ X_1$ is a line at right angles, if possible an axis of symmetry for the same reason as in the last construction. Above and below $O\ Y$ two lines, $A\ B$ and $C\ D$ are drawn parallel to it and situated at some exact distance d from it. The axis $O\ Y$ usually divides the length of the section $K\ L$ unequally, and about the best value for d is the length of the shorter of these segments O K in the figure. These lines $A\ B$ and $C\ D$ may or may not cut the section. Next draw a series of lines $J\ G$ parallel to $O\ Y$ across the section, and in each case set off $C\ E = O\ J$. Join $E\ F$, and produce if necessary to cut $C\ D$ in H. Join H to O, cutting $J\ G$ in G. (In this case $O\ H$ is produced.) Then G is a point on the required curve.

Repeat this for each of the lines drawn across the section for lines below $O\ Y$ using the lower parallel $A\ B$, and join all the points so found by a curve (dotted in the figure).

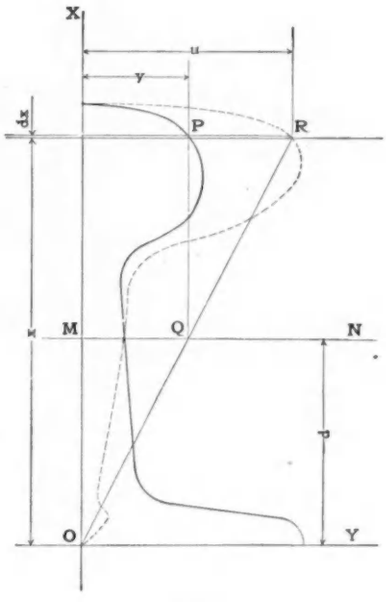


Fig. 1

FINDING THE CENTER OF GRAVITY.

Let the total area of this dotted curve $= A$; then moment of inertia of section about $O\ Y = A\ d^2$.

Proof—Let y = length of an infinitely narrow strip of width $d\ x$ at a distance x from $O\ Y$. Let u = length of an infinitely narrow strip of the derived figure at the distance x from $O\ Y$. By definition the moment of inertia of a plane figure is the sum of the products of each elementary area, into the square of its distance from the axis about which the moment is taken; or

$$I = \Sigma\ x^2\ y\ dx$$

The area of the derived figure is

$$A = \Sigma\ u\ dx \qquad \frac{y}{EJ} = \frac{CH}{CE} \qquad \frac{u}{x} = \frac{CH}{CO}$$

$$CE = x \qquad EJ = CO = d \qquad \frac{y}{d} = \frac{CH}{x}$$

$$\frac{u}{x} = \frac{CH}{d} \qquad CH = \frac{x\ y}{d} = \frac{u\ d}{x}$$

$$u = \frac{x^2\ y}{d^2}$$

$$A = \frac{\Sigma\ x^2 y dx}{d^2} = \frac{I}{d^2}$$

or

$$I = A\ d^2.$$

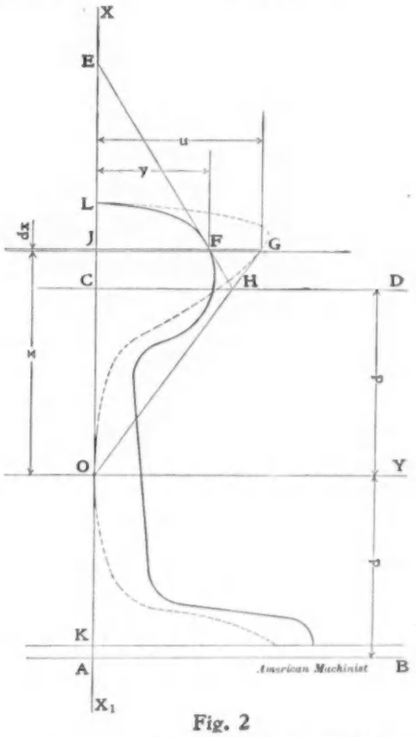


Fig. 2

FINDING THE MOMENT OF INERTIA.

The construction permits of many variations—*e. g.*, the new area can be obtained by using only one parallel; but the construction as given above will probably be found the most useful and accurate.

When the construction is made in connection with a bending problem, for which $f = \frac{My}{I}$ (these letters having their usual meanings), the distance d may be taken equal to y, in which case $I = a\ y^2$ and $f = \frac{M}{a\ y}$

While it is generally convenient to express the moment of inertia in inches, the

other factors of a problem may be expressed in feet. All that is necessary to remember, then, is that in any expression for I, each term will be found to contain four linear dimensions, and that therefore we have only to divide the quantity obtained in inches by 12^4 (20,736) to reduce it to feet. Take for example the formula $I_o + A x^2 = I$ for the moment of inertia of a surface about an axis not taken through its center of gravity.

I_o = moment of inertia through the center of gravity.

A = area of figure.

x = distance from the new axis to the center of gravity.

If the figure is a rectangle or a triangle, $I_o = \frac{b h^3}{\text{constant}}$, h being the hight and b the breadth; if a circle $I_o = \frac{\pi r^4}{\text{constant}}$ r being the radius, and so on, linear dimensions always appearing four times in I_o.

$A x^2$ may be rewritten $b h x^2$ for a rectangle, $\pi r^2 x^2$ for a circle, or $\pi a b x^2$ for an ellipse, four linear dimensions appearing as before.

The Draftsman, the Pattern Maker and the Molder.

The accompanying illustrations belonging with Mr. Jewett's article published last week under the above title, were accidentally omitted, and we insert them here. The sketches are interesting as showing how one foundry, by the ingenuity of its foreman, was able to do a rather difficult job more cheaply and expeditiously than another.

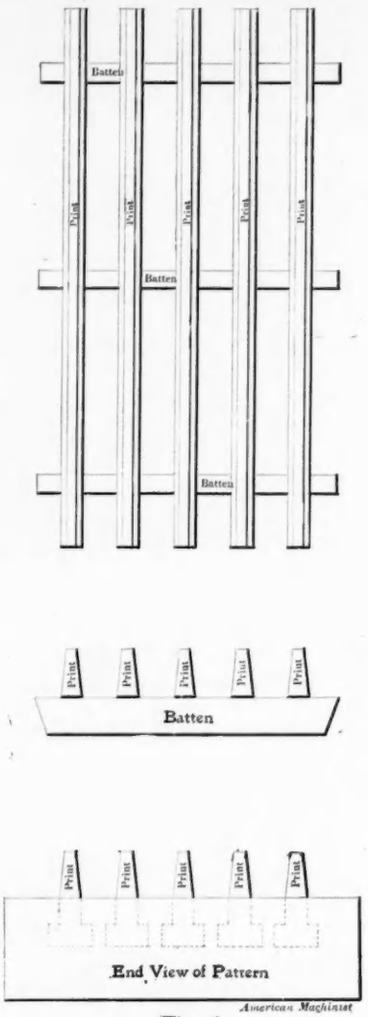
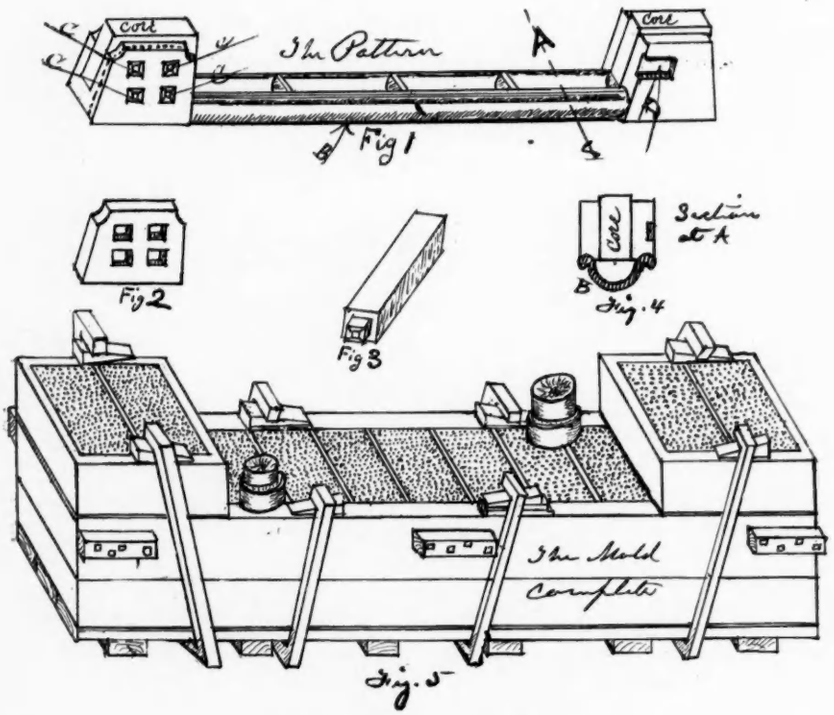


Fig. 1

MAKING T-SLOTS.



MOLDING A PECULIAR CASTING.

Letters from Practical Men

A Couple of Foundry Devices.

Editor American Machinist:

Not very long ago, having business with a concern that builds heavy machine tools, I was enabled to spend an hour or so in their foundry and witness some of their "stunts." While I saw nothing very startling during my short visit, still there were one or two things that were worthy of notice.

One man was engaged in making large radial-drill bases. These were of the ordinary type, with T-slots cast in the face side. The face side was cast down, and there were core prints on the face of the pattern to carry the T-slot cores. In order to avoid a "turnover," prints to match those on the pattern and fastened together with battens were used. The accompanying sketch, Fig. 1, shows how this frame was constructed, also an end view of pattern. This framework was bedded in the floor to the depth of the prints. After it was drawn the pattern was placed in position, the prints on the pattern filling the impression left by the match prints. The necessity of making a "turnover" before the cope could be rammed up was thus avoided.

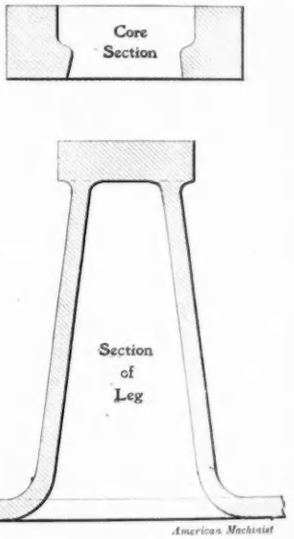


Fig. 2

MAKING ENLARGED END OF LEG WITH A CORE.

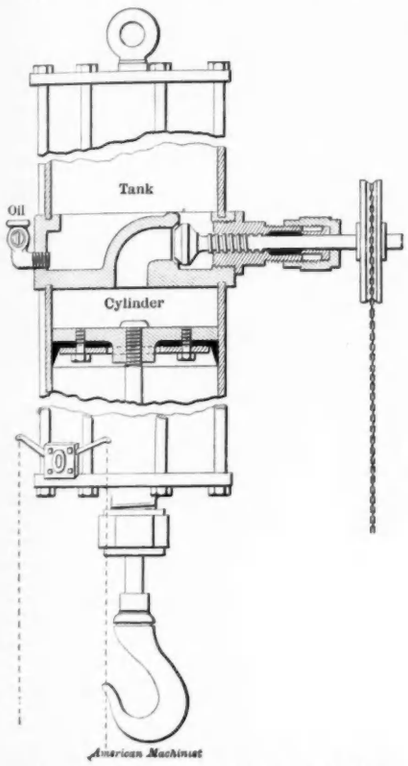
Another man was making a big jig that was to be used on some gun-carriage work. It was a triangular affair, with three square legs. These legs were on the side that was being molded down in the floor, and were of a section like Fig. 2. They had evidently foreseen that if the pieces to form the flange or enlargement on the end of the leg were made loose, it would have been next to impossible to pick them in, as they would have been 30 inches or more down in the bowels of the earth. Instead of loose pieces, a core like the sketch was used to form this

flange. It slipped over the end of the leg and was rammed up with the pattern, remaining in the mold after the pattern was drawn. HOBO.

A Controlled Air Hoist.

Editor American Machinist:

The sketch herewith shows an air hoist that has the steadiness of movement of pistons actuated by water pressure, which is very desirable if the load is to be pulled horizontally, or in any case if it is influenced by frictional resistance. It may also be used to lift a load part way up, then break the air connection, run the hoist away on the trolley, then lift the load



AN AIR HOIST WITH LIQUID CONTROL.

higher, as is sometimes required, as in pouring iron from a ladle.

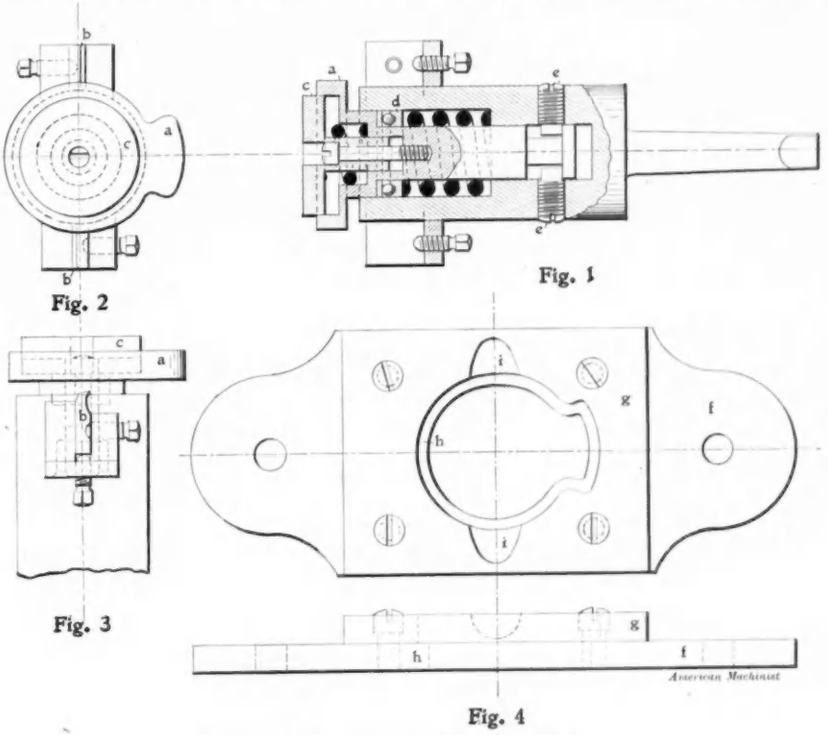
With the piston clear down, the cylinder is filled with engine oil, and the speed at which the piston rises is regulated by the valve in the top head, the oil in the cylinder flowing through the valve to the tank above. If the valve is closed before the piston is clear up, and the maximum air pressure admitted, the load may be lifted by opening the regulating valve after the air connection is broken. The small amount of oil that leaks by the piston should occasionally be driven from the bottom of the cylinder and returned to the tank. J. H. DUNBAR.

Youngstown, Ohio.

Tool for Facing the Edges of Stampings.

Editor American Machinist:

The accompanying sketches show a tool for facing or trimming off in the upright drill the irregular edge of a stamping. In the sketch is shown at Fig. 1 a section lengthwise of the body of the tool, Fig. 2 is an end view, Fig. 3 is a side view and Fig. 4 shows the jig or chuck for holding the stampings while being faced. The stamping in question in outline is the shape of the spring pad shown at *a* in the first three figures; it is 1-16 inch deeper than *a* and is drawn up out of No. 19 gage steel. To face the edge of one, we place a stamping in the chuck and lower and enter into it the spring pad *a* (the drill press is one of those lever feed arrangements, and the shifting of the belt is attended to by the foot, which is a good feature in this case, as it is necessary to start and stop for each operation). When



TOOLS FOR FACING THE EDGES OF STAMPINGS.

the pad is entered into the stamping, we start the press and begin to lower the revolving cutters, which are shown at *b*, and as they advance toward the work the stamping is pressed tighter on the bottom of the chuck by means of the spring.

A supplementary pad *c* serves to eject the stamping off from *a*, as otherwise it would cling by the burr thrown over by the cutters. *d* is a ball bearing to take the thrust of the spring against the shoulder on the stem to *a*. The upper end of this stem is necked to allow the two screws *e e* to catch in and prevent *a* from falling out. The body of the tool is a machinery steel forging, and the cutters are adjusted to position and held by the screws as shown.

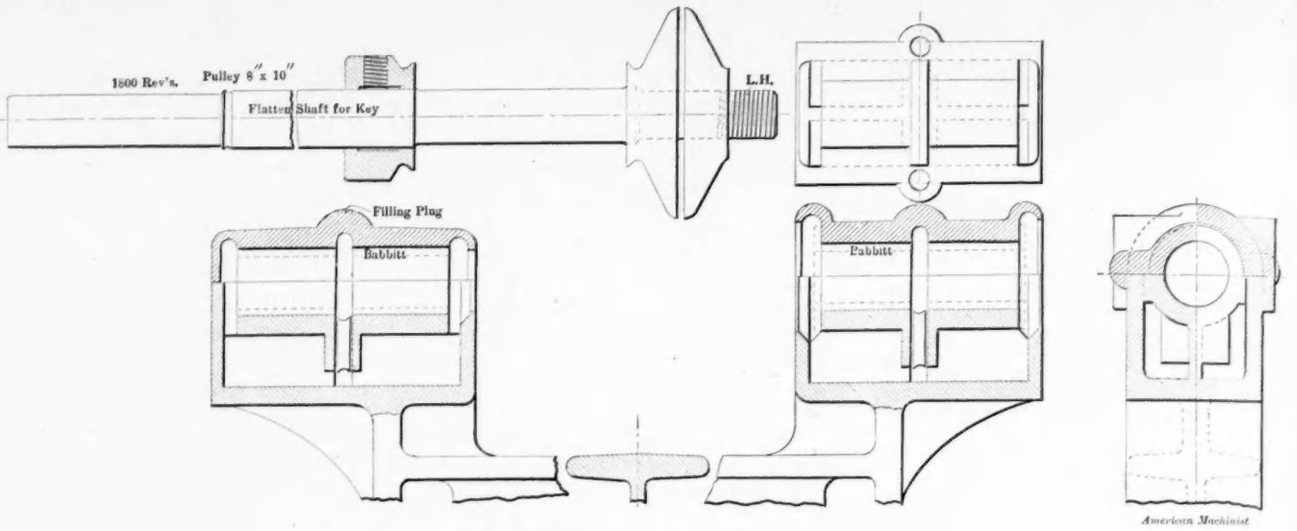
The chuck consists simply of base plate *f* and the plate *g*, which is cut out to fit the exterior of the stamping. The base is also cut out, leaving only a shoulder as shown at *h*, which facilitates the cleaning out of the chips; *i i* are two notches cut in to permit the taking hold of the stamping in removing it. This tool worked satisfactorily, and it could probably be adapted to the trimming of almost any stamping where the edge to be trimmed is approximately circular. A. C. MILLS.

Jackson, Mich.

A Community Draftsman.

Editor American Machinist:

It may interest Mr. Miggett to know that his idea of "A Community Draftsman" ("American Machinist," No. 26) who would make a business of doing the drafting and engineering work for a number of small firms, is quite practical, and has been in successful working order here in Philadelphia for some years. The man who runs the business would hardly claim "considerable breadth of engineering experience and the best technical knowledge," as it is suggested he should have; but with a fair amount of both, and by carefully avoiding unfamiliar work, the plan seems to work fairly well. Not only small firms without draftsmen find it convenient to do work this way, but some large ones have tried it with satisfaction—trolley roads, etc., who have the talent necessary to do their own engineering, but seldom require draftsmen. Some small shops try the plan of hiring a good draftsman for a short time at good big wages, while others keep an indifferent man at small wages, and worry along with work of a class that gives the man in the shop a poor opinion of the usefulness of draftsmen in general. Still others do without drawings, and depend on long consulta-



SELF-OILING BEARINGS FOR SAW ARBOR.

tions between the man with the idea and a patternmaker with a clean board, some chalk and a pair of compasses; but an increasing number make use of the "community draftsman," and by paying fair prices get satisfactory work, and do without the trouble and expense of a drawing-room outfit that is not first class, or is only used occasionally. The plan is a good one and works well here—so why not at other places? C. F. S.

Philadelphia.

Self-Oiling Bearings for a Saw Arbor.

Editor American Machinist:

I read with much interest the article in No. 25 of the "American Machinist," entitled "The Design of Oil Slings." I had never before realized that there was so much involved in a proper design for preventing the escape of oil. I enclose a sketch of a self-oiling box which I made a few years ago. Instead of a ring for carrying the oil, I use a piece of small common jack chain, with a small grooved roller to keep the chain down in the oil reservoir. I never noticed that oil creeps under the collar, but have seen rust accumulate on the arbor between the boxes. And oil certainly does not fall into the necks of collars, so I suppose it follows around the hollow in the cap, and so back to the reservoir. E. S. NEWTON.

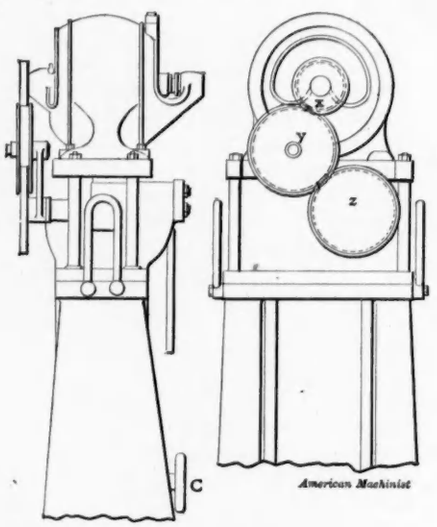


Fig. 1

UPPER PART OF THE ORIGINAL MACHINE.

A Belgian Improvement of an American Machine.

Editor American Machinist:

I send two sketches, Fig. 1 showing all that is essential of a Newton special milling and boring machine in my works, and Fig. 2 showing the machine as modified by me.

As you will see: First—I have changed the gears *X, Y, Z,* which give but one speed to the bar, for two cones and a belt. The machine is driven by an electric motor, which stands on the top, and the belt, although so narrow, will transmit 5 horsepower on account of its great speed.

Second—To advance the bar, instead of driving it by the hand-wheel *C,* as it was when I received the machine, I adopted the following modification: This hand-wheel *C,* keyed on the end of the shaft *O,*

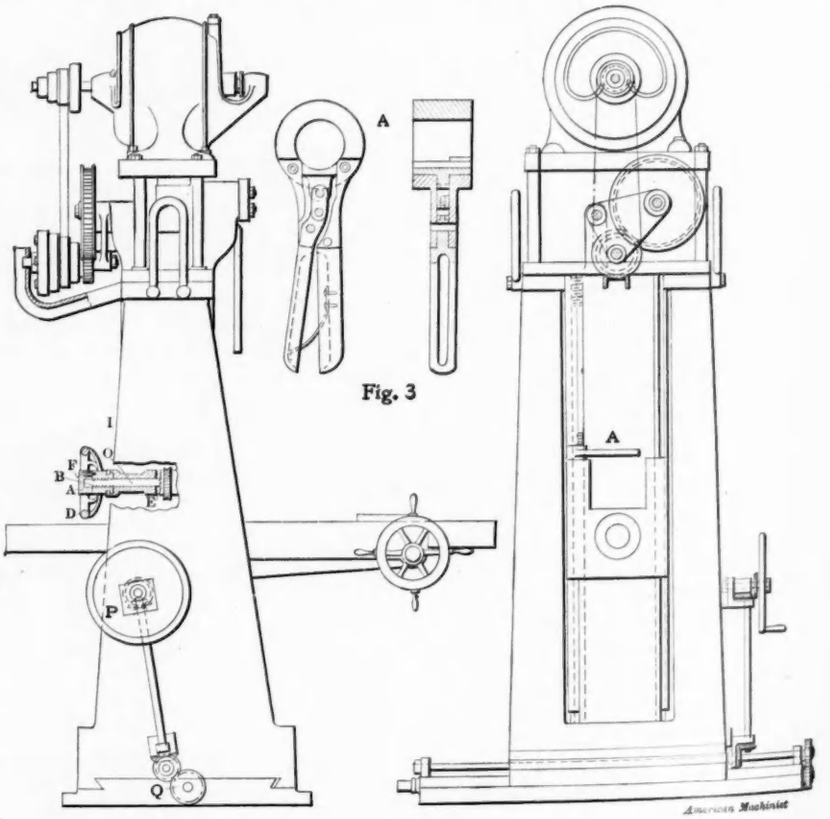


Fig. 2

IMPROVEMENTS ADDED TO AN AMERICAN MACHINE.

for moving the boring bar along, was placed very inconveniently for the workman. It should have been on the other end of the shaft at *D*. I did the thing very simply by changing the nut *B*, which was used to clutch in *E*, for a threaded hand-wheel *B D*. I put at *A*, on the end of the shaft, a fast collar with a pin *F*, by which the hand-wheel *B D* is made to turn the shaft *O*. I could thus easily move the boring bar back and forth by hand. When I wish to advance it automatically, I take out the pin *F*, give a small movement to the hand-wheel *B D* to engage *E*, so that the workman need not run around to the other side of the machine.

Third—I placed a lever *A*, Fig. 3, on the screw which moves the boring bar up and down, so that when it is brought very nearly to the required hight by the power, the final minute adjustment may be done by hand.

Fourth—I applied a drive for moving the entire machine along on its base, placing the hand-wheel *P* very near the workman, so that he does not have to change his place, and may readily see the bar while moving the machine.

You may be astonished that I bought this machine without these improvements; but at first it had only to be used to mill some upright pieces, and afterwards it was required for other work. I send you this information, thinking it may be interesting to your readers who have similar machines, and who also would like to use them for other work. A. BOLLINCKX.

Brussels, Belgium.

For a Stock-Company School Shop.

Editor American Machinist:

I want to see that matter of the shop school for the development of mechanical and engineering talent agitated until something comes of it. If such an opportunity presented itself, I should feel like throwing up my job and taking a course. The engineering school which I attended had a school shop as part of its equipment, where we went through a series of exercises in chipping, filing, etc., but the value of the knowledge acquired was about equal to that of the nondescript product. It was manual training that we got, and it has been of about as much practical value to me as has the two terms' work in French. Each had an educational value, no doubt, and I have used parts of each in my work, but I couldn't talk much French, and I found when I got out and at work that I did not know much about machine shop practice.

We need such shop schools as will give a broad foundation of practical knowledge and skill, and then build as big and high as the capacity of each individual permits. We shall need a good many of them if we, as a nation, are to keep first place in the mechanical world, and I'm afraid there are not enough very rich men ready each to endow one. However, if we want to start an ordinary business that is beyond our depth, we incorporate it and sell stock, and I don't see why the prospect of indirect dividends could not be made alluring enough to draw a fair amount of capital from those who would be benefited by the higher grade of ability obtainable. Somebody try it, and see how many manufacturers would take stock in a shop school. DENNIS.

Obligations of Advertisers.

Editor American Machinist:

This note refers to the article on page 627 of your issue No. 27.

It is true that advertisers, who often get thirty to sixty replies to an ad. calling for a single employee, generally fail to reply to most of the applicants. The reason is obvious. By far the greater number of replies are from persons not qualified for the position, and hence not the persons who were invited to reply, and therefore from persons who have put no "obligation" to respond upon the advertiser.

Perhaps, however, the main reason (outside of the non-necessity for replying where the reply must be unfavorable) is the feeling that, while the answer can do no practical good, it may discourage and do injury. On no account would the writer send a postal card in reply, feeling than an unfavorable answer should not be submitted, either to the family of the applicant, his employer, or even to fellow boarders. FREQUENT ADVERTISER.

Spiral Gears.

Editor American Machinist:

In answer to Mr. Bruce's letter in issue No. 26, in regard to solving simple problem, would like to state that issue No. 15 was not then published, also that I was relating my application of the Brown & Sharpe rules, not any rules of my own. I do not agree with him when he says that such problems do not occur; I know of several cases where the centers were fixed and the angles had to be changed to suit the e centers.

Everybody that has had much to do with gas engines knows that the maximum efficiency of the gearing is not required to run the valve gear, and that if the driven gear were made twice the size of the driver, it would in most cases conflict with the flywheel; therefore, what is more natural than cut the driven gear down in size when it can be done by changing the angle? Suppose on some machine there are fixed centers for two shafts geared together by spirals running in oil in cases, which cases, by reason of their surroundings, are limited as to space, and for some reason or other the ratio of speed of these two shafts must be changed, what would we do in this case; would we build a complete new machine?

I think that in nine cases out of ten the angle would be changed and the gears go in that same case. ERNEST J. LEES.

Has the "Fittest" Steady-Rest Survived?

Editor American Machinist:

I recently saw an up-to-date engine lathe just fresh from the builder. It was driven by an electric motor; there was a stop on the carriage that would stop the lathe at any point desired; there was a scheme for screw cutting, by which you could cut any thread wanted without taking off a lot of gears and putting on others; there was a power feed to the compound rest, and a lot of other handy rigs to relieve the weary machinist. In short, it was a well-built modern tool, capable of doing good work and lots of it. I admired everything about it, until I came to the steady-rest; then I was disappointed, for there was an exact copy of the first steady-rest I ever saw. The old one has, in fact, some points in which it is superior to the new one. It has been bored out on the ways of the lathe, and is central with the lathe centers either way about. It stands parallel with the face-plate. The new one is a rough casting, just as it came from the foundry, with the least amount of work possible put upon it. The bore is not central with the centers of the lathe; the screws for adjusting the jaws are cheap iron set-screws, and are a poor fit in the thread. It does not stand parallel with face-plate, either vertically or horizontally; in fact it does not stand in line with anything, unless it be with sham workmanship. To be sure, the old one has seen hard service. It has been broken and patched several times; it formerly had cast-iron jaws of good size, one of which is still in use; one of the others is a piece of fish-plate, picked up off the railroad track in front of the shop, and the other is a piece of wagon tire, which some tired machinist has put on in a hurry and fastened with a plow bolt.

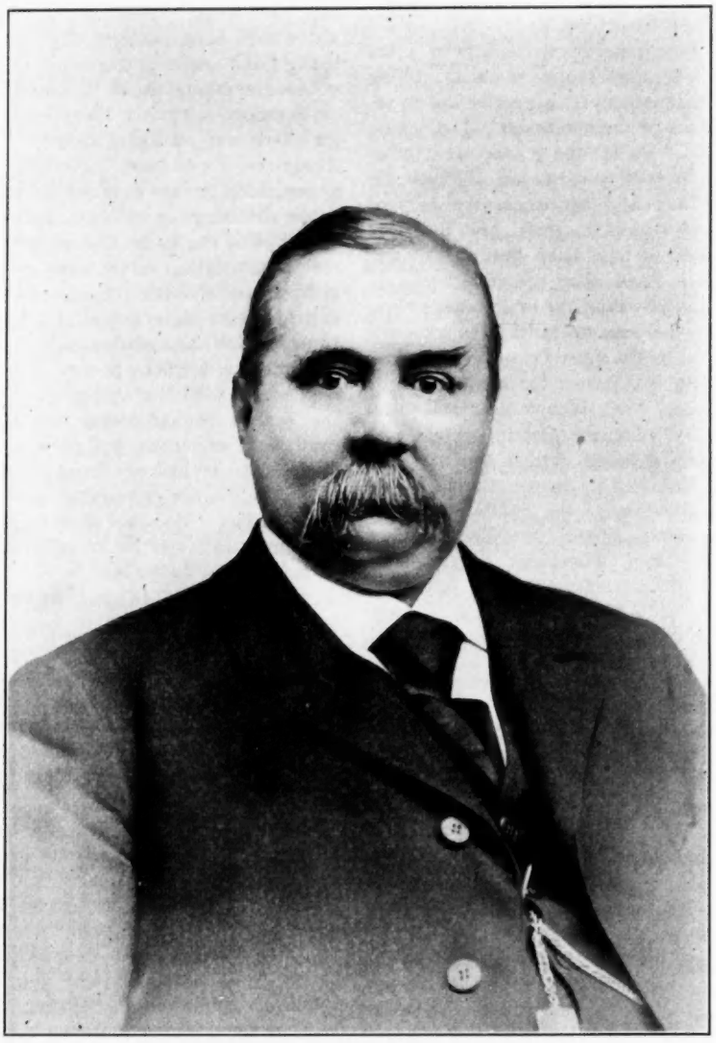
I have been able to trace the history of this old steady-rest back about fifty years. How much older than that it is I can only guess. It may have been made seventy-five or eighty years ago. But someone will say, "Why has it not been broken up and thrown into the cupola long ago?" Simply because nothing better has appeared to take its place, judging by the one on the new lathe. Besides, machine-shop proprietors do not throw old tools into the scrap pile. They clean them and paint them up and sell them to somebody else. Who ever heard of a lathe or planer wearing out?

You usually will find the steady-rest on the floor, under the lathe, covered with grease and dirt, or else in some dark hole or corner, covered with scrap iron, blocks of wood and other old trash, and when it is wanted it has to be mined out. When the machinist gets through using it, does he clean it up and put it away where it will be handy for the next job? Not much: life is too short. He loosens the bolt on the clamp, jerks it around and lets it fall

through the ways of the lathe on to the floor. Then he goes and gets a bunch of clean waste and wipes his hands off clean. A machinist will work all day with black hands and a bunch of dirty waste and think nothing about it, but whenever he uses a steady-rest and gets through with it, he invariably hunts up a bunch of clean waste and wipes his hands clean, with the sense of washing his hands of the whole steady-rest business. A steady-rest seems to be a thing that the manufacturer throws in with the lathe, very much the same as the hardware man, if you buy an ax or hammer, throws in a handle, which it will pay you to throw away and not try to use. I am sometimes led to call the whole steady-rest business a humbug, and not in touch with modern tools and ideas; but I must be mistaken, for on this modern, up-to-date lathe I see the same thing; therefore I am led to believe that this ancient and modern steady-rest is perfect, and that it is impossible to further improve it; that it is an example of the "survival of the fittest," and is here to stay as long as lathes are used. ELEMO.

Death of J. G. A. Meyer.

J. G. Arnold Meyer, who was for several years an associate editor of this paper, died of apoplexy, July 15, at Paterson, N. J., where he lived. Mr. Meyer was born in Berlin in 1841. While he was still quite young his father went to live in England, and Meyer's schooldays were spent there, although all his life he betrayed the accent and carried various unmistakable characteristics of a German. When he was about twenty the family emigrated to Canada, and soon after that he was at work in Boston. Later he held various positions in New York City. He was at the Delamater Iron Works for a time, and was under Gen. McClellan when he was building docks for the city, and by whom he was held in high estimation. His longest period of service was as head draftsman of the Grant Locomotive Works at Paterson. While in this position he became a contributor to our columns, and later was engaged in editorial work, his name first appearing as associate editor in October, 1887. His connection with the paper terminated in 1895.



J. G. A. MEYER.

Mr. Meyer was an unsurpassed draftsman, and his specialty in technical work was in dealing with the problems and in describing the methods of the draftsman. His work on "Machine Drawing and Machine Design," which he considered the culminating and monumental work of his life, all of which is not yet published, treats of the work of the draftsman with a detail and completeness only possible to one in love with and entirely engrossed in his profession. His book on "Modern Locomotive Construction" is essentially a draftsman's book, and from that standpoint it is a very complete detailed description of the locomotive as he knew it. Outside of his special line of work in which he so excelled, he had his limitations. While he may be said to have been a born draftsman, he could hardly be said to be a born mechanic or engineer. His attainments in that line were the result of close application and hard study. In the general affairs of life or of business his attitude was as simple and unsophisticated as that of a child. He made no enemies, and all who were associated with him always had only the kindest of memories and the heartiest of good wishes for him. He was of the kind who are sincerely mourned when they leave us. A prominent characteristic of Mr. Meyer was his exceptional, one might almost say his extreme conscientiousness. Whatever he believed to be right, that he could be depended upon to do, if it were possible for him to accomplish it, and the strictness with which he adhered to the rule, "Speak evil of no man," was exceptional and remarkable.

Some Impressions of the Paris Exposition.

What do you think of the Exposition? How does it compare with Chicago? How much is true of the stories we hear regarding the extortion practiced upon visitors? are the first questions usually asked of me when I meet friends who know that I have spent about three months in Paris, and perhaps a brief statement of the reply I am able to make to these questions will be of interest to some others who have not the opportunity of questioning me personally, while the reply will also pass, perhaps, in lieu of separate and personal answers to letters upon the subject.

In the first place, I may say that I think very well indeed of the Exposition, and believe that no one who has the physical strength and other requirements for the job, and who takes an interest in seeing what men can do and are doing ought to miss it, if it is practicable for him to go to see it.

It is difficult, however, to compare it with Chicago. The Paris Exhibition, like that at Chicago, may be said to be dual in character. That is to say, there are the exterior and the interior exhibits to be considered in each case. I think the ex-

terior exhibit—the buildings and grounds—at Chicago were far superior in attractiveness to those at Paris. They are beautiful and attractive at Paris, but it seems to me not nearly so grand, impressive and inspiring as the Chicago show of architectural art and landscape gardening. The view of the main buildings on the Champ de Mars, when one stands near the Eiffel Tower and looks toward the Palais d'Electricitie and the Chateau d'Eau, is certainly very attractive, but, it seems to me, not nearly equal in impressive grandeur to the Court of Honor at Chicago, with its MacMonnies fountain, its placid sheet of water, the facades of the various buildings defining it, and the peristyle with the blue waters of Lake Michigan for a background.

A method of illuminating buildings is in use at Paris that had, I believe, not been brought into use and was practically unknown when the Chicago Exhibition was held. It will be remembered that at Chicago the buildings facing upon the Court of Honor were illuminated by having rows of incandescent lamps placed along the lines defining the main architectural features of the buildings. At Paris the detail ornamental features of the façade of the Palais d'Electricitie are made of semi-transparent material, which at night can be illuminated by electric lights placed behind it, and as the architectural details are traced out by the light and changes are made in the designs exhibited, by various circuits controlling the lights and arrangements of color, the effect is extremely beautiful. One of the smaller buildings, the Palais Lumineaux, is composed entirely of semi-transparent material, resembling the opal by day, but is brilliantly illuminated at night, and this applies not only to the side walls, but to such details as the flights of steps leading up to the main entrance with their ballustrades and handrails; all are brilliant with a remarkably evenly distributed light, so that the building looks, not as though it were illuminated by interior lamps, but rather as though it were constructed entirely of luminous material. A small sheet of water in front of it repeats the scene by reflection and the effect is very striking and beautiful.

The Salle des Fêtes, too, with its splendid dome, mural paintings and decorations, is well worth seeing; but where, it seems to me, that Paris surpasses Chicago is in respect of what is shown within the buildings. Paris is near the center of all those industries and occupations that result in the production of what we call art goods, decorative articles and bric-a-brac. This is there in profusion, and the exhibit, taken as a whole, is less that of one country and much more of a world's exposition than Chicago was or could be expected to be under the circumstances.

I believe there is very much exaggeration in the tales of extortion that are told about Paris. There are high-priced hotels and restaurants in Paris as there are in every large city, and there are also very cheap ones, and with a little search one can usually find accommodation suited to the ratio existing between his desire for creature comforts or luxuries and the length of his pocket-book, be the latter great or little. Especially is this true if one speaks a little French. During my three months' stop there I had absolutely no trouble with a cab driver. The legal fares, which are low, have not been advanced, and I never had a cabbie try to charge more than the legal fare or more than I considered a fair amount. Probably there have been cases of extortion or attempted extortion, but certainly if there were much of that I would have encountered at least some of it. On the other hand, I know of cases in which visitors have demanded unreasonable things of cab drivers and have complained of extortion and insolence when cabbie refused. Transportation by the river boats, by the omnibus lines and trolleys is very cheap, although all these means of getting about are of course likely to be swamped with passengers at certain times, so that one may have to wait a long time for a place, no overcrowding being allowed.

It is probable that many of the stories that seem to disparage the Paris Exposition have their origin, queerly enough, in politics. All those who in Paris or France are opposed to the present government of France seem to want the Exposition to fail, and with them "the wish is father to the thought." The Exposition is a government affair, and if it turns out to be in every way a complete success the credit of it will very naturally go to the government. Those therefore who are opposed to the government and wish to overthrow it and substitute one more to their liking or none at all, do not want the Exposition to be successful, and are doing everything in their power to prevent it from being so. At least, that is what is charged against them by the supporters of the government and of the Exposition, and I have no doubt there is much truth in it.

Even the machinery exhibit is in many respects far more interesting than that at Chicago, because it comes from practically every machinery building nation on earth; whereas at Chicago there was comparatively little besides American machinery, with which, of course, Americans interested were already familiar. And at Paris America makes almost as good a machinery exhibit as at Chicago, except in steam engines, of which there are none at Paris of American make. England shows almost no steam engines, and the most prominent exhibit of stationary steam engines is in the German section, steam engine men awarding the palm for fine running and beautifully designed machines to the Swiss firm of Sulzer Bros., and at the same time almost unanimously declaring that the booby prize in that class, if one were to be awarded, would go to French builders, if there were an impartial decision based on merit, the inevitable conclusion being that as set forth by this exhibition and independently of any other evidence, the French people are not strong as machinery constructors. They do a great many other things surpassingly well, but with all due respect for them, machine construction is not their forte; the few able men among them being all the more conspicuous, of course, by reason of the fact that they have so little company in their own country. F. J. M.

Legal Notes—Where Negligence Was Not Shown—Unsound Clamp on Derrick.

BY WM. MARSTON SEABURY.

Michael Kennedy's suit against Allentown Foundry and Machine Works was recently decided by the New York Appellate Division of the Supreme Court in the Second Department.

It appeared that the defendant, a foreign corporation, was engaged in completing a piece of contract work in Brooklyn, and it was necessary to lay certain pipes in a trench. It was Kennedy's duty to assist in laying these pipes.

A rope was attached to the last section of pipe, which extended through the foundation wall of the building, and laborers inside the building were to pull the rope when those outside were ready. The superintendent of the work was not present, but an employee known as "Johnny" was upon the bank of the trench giving directions. The plaintiff was ordered to go down into the trench and to place a block under the end of the pipe when it was lowered, to prevent it from sinking into the earth.

When all was ready "Johnny" called "go ahead," and the rope was pulled; the pipe moved and swung around in such a manner as to strike the plaintiff's legs, causing the injury for which he sought to recover damages. The trial court dismissed the plaintiff's complaint upon the ground that he had failed to show negligence on the part of the defendant and freedom from contributory negligence on his own part, and particularly upon the ground that Johnny was a fellow servant of the plaintiff, and that the plaintiff could therefore not recover. The Appellate Court held that the defendant owed the plaintiff the duty of providing a reasonably safe place in which to work, proper appliances to work with, and to exercise reasonable care in selecting and employing workmen who were to labor with the plaintiff, but that there was no evidence of any failure on the defendant's part to perform any of these duties. The judgment for the defendant was therefore affirmed. (49 App Div., 78.)

UNSOUND CLAMP ON DERRICK.

James Welsh was injured while in the employ of J. B. & J. M. Cornell, and brought suit to recover damages for his injuries. Welsh was engaged in carting

iron beams and in unloading them at a storage yard of the defendants. He and three other men had taken a load of beams to the yard, and were engaged in removing them from a truck and piling them up when the accident by which he was injured occurred.

The place in the yard at which he was working was under a guy rope which was attached to a large stationary derrick, capable of sustaining a weight of at least 3½ tons, and used by the defendants in their business for the purpose of lifting heavy masses of material. The guy ropes were fastened at the top of the mast by a part of the apparatus called a spider, and they extended to iron posts, where they were secured by being attached to clamps or iron straps, which were fitted around the posts and kept in place by bolts and nuts. While the plaintiff was at work under one of these guy ropes and immediately in front of one of the posts, that is, between the mast and the post, the clamp or iron strap attached to the post gave way, and the guy rope with a section of the clamp adhering to it fell, struck the plaintiff, severed the thumb from one of his hands, and so injured the first finger of that hand that an amputation became necessary, and was had. The trial court dismissed the plaintiff's complaint upon the ground that there was no evidence to go to the jury upon the question of defendants' negligence. The plaintiff appealed from this judgment to the Appellate Division of the New York Supreme Court, First Department.

There was evidence before the trial court that the defect in the iron clamp was one in the material of which the clamp was made, or that it was a defect which might have been occasioned by overstraining the clamp (a consequence of subjecting it to an excessive tensile stress), which defect could have been discovered had a reasonable inspection of the post and clamp been made. The derrick had been in use not more than from two to six weeks. The clamp was forged in the defendants' iron shop by the defendants' blacksmith and from their materials.

The plaintiff showed that the breaking load in good condition for each half of such a clamp as that which broke was 6,500 pounds; that if bolted securely to the other section the breaking load of both when fastened together would be 13,000 pounds if the clamp were of sound iron, properly forged; and there was also further evidence showing the defective condition of the clamp.

The Appellate Division held, Justices Van Brunt and Patterson dissenting, that the evidence tended to show either defective material in the first place or misuse in the second place, the result of which misuse in its effect upon the iron could have been detected by a proper and sufficient inspection, which was not made.

A new trial was therefore ordered. (49 App. Div., 203.)

American Engineers in Berlin.

We are indebted to the Philadelphia "Ledger" for the following interesting account of one notable event of the European trip of the American engineers:

Berlin, July 18.—The banquet given at the Zoological Garden this evening by the firm of Ludwig Loewe & Co., rifle and gun makers, to the visiting delegation of mechanical and civil engineers, who arrived yesterday, took on the character of a fraternization of Americans, Germans and English as the leaders of the world's progress. The principal speakers were from the United States, Germany, England and Australia.

Commerzienrath Isidor Loewe, president of the firm, who made the first address, emphasized the indebtedness of German industry and of his own firm to the Americans. C. H. Morgan, president of the American engineers, in his response, expressed astonishment at the extent to which American ideas had been introduced into Germany by Ludwig Loewe & Co., adding: "We must do something in America to meet this new competition."

Mr. Dickie, of the Union Iron Works, San Francisco, emphasized the humanitarian care shown by the Ludwig Loewe Company for their workmen, in which respect he said the Germans were ahead of America. "We in America," remarked Mr. Dickie, "have forgotten the man, the soul, in order to promote business."

John B. Jackson, Secretary of the United States Embassy, said he spoke from the standpoint of one whose task it was to help promote friendly relations between Germany and the United States. He thanked the Loewe Company heartily for having done so much in the same direction.

Speeches were made also by Mr. Thomas Irons, of Australia, and by Professor Reauleaux, who came into prominence at the time of the Centennial Exhibition in Philadelphia because of his reference to the German exhibit there as "cheap and shabby."

A band in the park discoursed American airs and Sousa marches.

The Loewe Company have arranged a fine three days' programme for their guests, who number about sixty.

To-day the Americans visited the Loewe Tool Works, and subsequently the small-arms works. The former contained $200,000 worth of American machinery, purchased in 1898. At the small-arms works the visitors were shown a new army pistol firing a hundred shots a minute.

Personal.

Henry Dreses, of Cincinnati, sailed from New York on the 18th inst. for Europe.

Max Daunert, manager of the New York branch of Schuchardt & Schütte, sails for Europe July 26 on the "Fürst Bismarck," to be gone several months.

W. F. Dixon writes us that he has resigned his position as chief engineer of the locomotive department of the Sormovo Works, Nijni-Novgorod, in order to enter the employ of the Singer Manufacturing Company, and that his address in future will be Podolsk, Moscow Government, Russia.

Mr. C. O. Brunner, treasurer of the Bethlehem Iron Company and Bethlehem Steel Company, completed on July 12 his fortieth year of service. The occasion was marked by the presentation to Mr. Brunner of a silver pitcher and salver and a handsome cane from his fellow members of the staff of the two companies.

Obituary.

Gustavus S. Foos, a veteran manufacturer of Springfield, Ohio, died in that city on July 12, aged eighty-two years. He was president of the Foos Manufacturing Company, and had been engaged in business at Springfield for over half a century.

Winthrop Thayer, president of the firm of Thayer & Co., builders of steam boilers, died July 19, thirty-seven years old. Mr. Thayer, who was a native of Boston, was for several years the New England manager of the Babcock & Wilcox Company, leaving that firm to become the head of Thayer & Co. He was an associate member of the American Society of Mechanical Engineers.

George A. Hill died at Matamoras, Pa., July 17, forty-seven years old. He was born at Charlestown, N. H. He went to work at seventeen years of age, in the shops of the Lake Shore Railroad at Norwalk, Ohio. He later became a draftsman for the Erie, and was a number of years at Susquehanna, Pa. In 1881 he was master mechanic of the Greenwood Lake Railroad, and after that he was master mechanic and car builder for the Chicago & Alton; but for the last fifteen years he had been in the expert department of the Galena Oil Company, of Franklin, Pa.

Statistics of Cincinnati's Tool Industry.

The growth of machine tool trade in Cincinnati, more especially in the last two years, is known by all connected with the industry to be enormous, but a quantitative statement of the same other than of very rough nature has not hitherto been forthcoming. A pamphlet on "Leading Industries of Cincinnati," published by the "Cincinnati Enquirer," has lately been sent us. It contains a brief chapter on machine tools, and in this are given some interesting statistics.

Ten years ago Cincinnati had only five or six machine tool factories. In 1899 twenty-five manufacturers of machine tools were at work in the city, and this year the number has been brought up to twenty-nine. Statistics which are stated to have been compiled after inquiries of nearly every one of the machine tool con-

cerns in the city as to their capital, output and number of men employed, together with careful comparisons from various trustworthy estimates are tabulated as follows:

	Number of Factories	Capital Employed	Value of Output	Number of Hands
1899....	25	$1,805,000	$3,340,000	2,798
1898....	21	1,710,000	2,100,000	1,870

To the figures for 1899 should be added data of four concerns started in 1900 with a combined capital of at least $175,000, in order to bring the table up more nearly to date. This table shows that the number of hands and value of output was more than one-half greater in 1899 than in 1898, although no large increase is accounted for in number of factories or in capital employed. This indicates how the works were crowded, or how they had been enlarged without altered showing in the amount of capitalization. A comparison with 1897 would be instructive, and would probably offer other evidences of radical increase. In 1898, it is said, fully 50 per cent. of the output was exported, and in 1899 the quantity was about the same, but the proportion smaller, owing to the growth of domestic trade.

In the line of wood-working machinery, to which another chapter is devoted, there are six plants at Cincinnati. Their capital aggregates about $2,695,000. Their output in 1898 amounted to about $750,000, and that for 1899 $1,550,000. The number of men employed was less than 700 in 1898, and in 1899 1,130; but if the men kept at work in outside foundries were included the number would be not very far from 2,000. Not less than $400,000 worth of wood-working machinery was exported from Cincinnati in 1899.

The chapter on machine tools above mentioned, which contained a general discussion of the industry in Cincinnati, was founded more or less upon a paper read by Mr. Philip C. Fosdick before the Manufacturers' Club.

The production of cotton-seed oil in the United States has increased from 3,000,000 gallons in 1875 to 75,000,000 gallons for the present year. Last year 94,000,000 gallons were produced.

There was recently received at the Assay Office in this city a cast lump of gold from British Columbia weighing 7,897 ounces, and valued at $135,275. They say they will have to make a special melting pot for it, as none in stock is large enough. Any machine shop would cut it up into as many pieces as necessary just for the chips.

New Catalogs.

We have received a catalog of the College of Engineering of the Ohio State University, Columbus, O., describing courses in various scientific and industrial branches. Size, standard, 6x9 inches.

The Anciens Ateliers de Construction, van den Kerchove, Societe Anonyme, Coupure, 203, Ghent, Belgium, have sent us a catalog of steam engines with distribution by a system of completely balanced piston valves. It is printed in French. Size, 6¼x9¾ inches.

The Hoefer Manufacturing Company, Freeport, Ill., sends its illustrated catalog, No. 5, of drill presses, power hack-saws, saw blades and drill chucks, furniture and bed-spring machinery, wire straighteners and cutters, bicycle machinery. Size, standard, 6x9 inches.

The Sprague Electric Company (general offices, 527 West Thirty-fourth street, New York) sends a catalog, No. 100, of the Lundell generators, direct-connected and belted types, which it manufactures. The features are quite fully described. Size, 7x9¼ inches.

The Rue Manufacturing Company, 215 Race street, Philadelphia, Pa., sends a catalog of "Little Giant" and "Unique" injectors, Rue's patent boiler washing and testing apparatus, general jet apparatus, ejectors, steam valves and boiler checks, Standard size, 6x9 inches.

Geo. D. Pohl Manufacturing Company, Vernon, N. Y., sends a catalog, No. 5, of the "Advance" gas and gasoline engines for stationary and portable purposes, manufactured by it. They are made vertical or horizontal,

(*Continued on page* 48.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Dies & punches. Amer. Hdw. Co., Ottawa, Ill.

Gear Wheels, gear cutting. Grant; see p. 22.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted to Rent—A small, well-equipped machine shop. Address T. C., AMER. MACH.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Wanted—Parties with facilities to manufacture medium and heavy high-grade machinery. Address "Phila.," care AM. MACH.

Choice Factory Site.—In Jersey City, N. J., 2 acres, close by switch, C. R. R. N. J.; on trolley route; near M. & E. Canal. Address "B.," AMERICAN MACHINIST.

Wanted to Rent—A small machine shop and foundry with modern tools, or join someone; I have a desirable line of machinery trade established. Box 188, AMER. MACHINIST.

Good, practical machinist wanted to run machine shop of his own in central part of Wisconsin; must have $3,000 capital; good business and location. Box 175, AM. MACH.

Gear and Milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

For packing rings that make a piston valve steam tight and nearly frictionless, that do not wear narrower, their groove wider, nor the seat larger at the port than elsewhere, write J. H. Dunbar, Youngstown, Ohio.

Wanted—A small gasoline engine to manufacture by party about to engage in manufacture of engines; inventor must be practical machinist and draftsman and capable of taking care of shop. Box 193, AMER. MACH.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodoridge st., W., Detroit, Mich.

Wanted—A first-class office man to take half interest in machine-tool business; location in a city of 45,000 inhabitants in Ohio; must have ability to take charge of office and from $20,000 to $25,000 in cash, increasing our business; don't need the money unless the right man applies; the man and money go together in this opportunity to find position and investment. Address Box 184, A. MACH.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Draftsman and machinist seeks position; general machinery. Box 195, AMER. MACH.

A successful machine-shop foreman is open for engagement. Box 196, AMER. MACHINIST.

Experienced machinist and draftsman wants place; age 25; can handle men. Box 165, AMERICAN MACHINIST.

Foreman machinist wants charge of a Western jobbing shop; some experience in manufacturing. Box 179, AMERICAN MACHINIST.

Young man having had experience in the designing of tools, jigs, fixtures and automatic machinery, desires position. Box 187, AM. M.

Wanted—Position as foreman; have 5 years' experience in handling men on engine, mining and electrical machinery; can give reference. Box 180, AMERICAN MACHINIST.

General foreman wants position; any kind of machinery, Corliss and slide valve engines, vertical or horizontal, water-works machinery, ice machinery, etc. Address "System," AMERICAN MACHINIST.

Superintendent of large screw and bolt works desires to change; mechanical engineer; 12 years in charge of bicycle, electrical machinery and machine-tool plants. Box 177, AMERICAN MACHINIST.

Superintendent of wide experience in designing and building machinery desires change; energetic, practical and reliable; good work at minimum cost a specialty. Box 191, AMERICAN MACHINIST.

Situation wanted by young man where improvements upon old or new devices are desired in the manufacture of or workings of mechanical or electrical apparatus. Address Box 183, AMERICAN MACHINIST.

Position wanted, as draftsman, by experienced man, in construction of steam engines (other than Corliss type); foreign references; age 29; speaks German, French and English. Address Box 189, AMERICAN MACHINIST.

Technical graduate (26), 3 years' experience in shop drafting room and office, possessing executive ability and business diplomacy, desires position in office of manufacturing concern. Address M. E. W., AMER. MACH.

Position by young man experienced as superintendent of manufacturing works where typewriter, light automatic machines, electrical and hardware novelties have been manufactured at a profit. Box 185, AMER. MACH.

Twenty years' experience (12 as draftsman, foreman and superintendent) has fitted the applicant to superintend your shop if you manufacture light interchangeable metal work by modern methods. Address Box 192, A. M.

Position as manager or superintendent of an enterprising modern general machine shop or a manufactory of interchangeable automatic machines; would also consider a position to travel in Europe with special machine, as I have already had good experience in this line. Box 186, AMERICAN MACHINIST.

Toolmaker and machinist of ability and long experience wishes position, preferably as foreman or superintendent; expert on labor-saving tools and up-to-the-minute methods of doing things; good draftsman; accustomed to handling men on first-class work so as to get quick results at small cost. Box 155, AMERICAN MACHINIST.

Young man, experienced in general heavy work, such as detailing, assisting, designing shop and perspective drawings, general plans, etc., in a prominent engine concern of the Middle States, desires change of location, preferably the East, wherein a chance for advancement is held out if satisfactory; good references if wished. Address X. Y. Z., Box 182, AMERICAN MACHINIST.

Help Wanted.

Machinists wanted; good wages and steady work. Apply De La Vergne Ref'g Machine Co., foot E. 138th st., New York.

Patents obtained: American, foreign; long experience; low charges. Edwin Guthrie, Registered Solicitor, Washington, D. C.

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(*Continued from page 47.*)

the latter being built as high as 100 horsepower. Size, 5½x9 inches.

The Stark Tool Company, Waltham, Mass., sends a catalog of bench lathes having antifriction ball bearing end thrust and fitted with automatic turret head, milling attachment, etc.; also pinion and wheel cutting machines, milling cutters, reamers and other fine tools and supplies. Size, 8¾x5¾ inches.

The Baylidon Machine & Tool Company, 20 Morris street, Jersey City, N. J., sends us a little catalog of its interchangeable tool-post system for duplicate lathe work. This is a simple device applicable to old lathes and designed as a substitute for turrets to facilitate manufacturing operations. Size, 6x3 inches.

Walter Scott & Co., Plainfield, N. J., send four catalogs of their large cylinder printing presses, two-revolution and stop-cylinder printing presses, flat bed perfecting and all-size rotary web presses and lithographic printing machines. Some of the styles shown are new. Size of each catalog, standard, 9x6 inches.

The George Gorton Machine Company, Racine, Wis., sends a catalog showing those of its grinding machines adapted to flat surfaces. A number of line drawings of details are among the illustrations. A cementing press, revolving tool racks and grinding supplies are also described. Size, standard, 6x9 inches.

The Fort Wayne Electric Works, Fort Wayne, Ind., manufacturers of the "Wood" system apparatus for light and power, have published a pamphlet filled with diminutive illustrations of their product. They send also a bulletin, No. 1010, of the B. & B. commutator truing device. Page size of each, 7¾x10½ inches.

We have received "Catalog 13" of the Ferracute Machine Company, Bridgeton, N. J. It refers to nearly 500 kinds and sizes of foot and power presses, lathes, beaders, dies, etc., for working bar and sheet metals, paper, cloth and leather. Some of the cuts are unusually large ones for a catalog. Size, 7¾x10½ inches.

The Ferracute Machine Company, Bridgeton, N. J., has sent us Catalog 13, referring to nearly 500 kinds and sizes of foot and power presses, lathes, beaders, dies, etc., for working bar and sheet metals, paper, cloth and leather. It supersedes all previous catalogs and is preliminary to a larger and more complete one. Size, 7¾x10½ inches.

Burnham, Williams & Co., Philadelphia, Pa., have sent us a pamphlet, designated No. 19, containing some further data and illustrations of recent construction by the Baldwin Locomotive Works. It is printed in English and French. There is a frontispiece showing locomotives in process of erection in winter on shore of frozen bay near Vladivostock. Size, standard, 9x6 inches.

The Q & C Company, Chicago and New York, sends us its 1900 catalog of pneumatic tools for chipping, calking, beading, riveting, drilling, wood boring, flue rolling, stone cutting and hoisting. There is sent also a catalog of the company's metal-sawing machines, which are made in both circular and reciprocating types and in many styles. Size of each catalog, standard, 9x6 inches.

The Weber Gas & Gasoline Engine Company, Kansas City, Mo., has just issued catalog No. 16. It builds quite an extensive line of these engines and carries them into specialties of application. The manufactures of the company shown in the catalog include an assortment of hoisting apparatus and supplies, pumps, air compressors, etc. Many testimonials are reproduced. Size, 9¼x6 inches.

(*Continued on page 49.*)

Help Wanted—Continued.

Foundry foreman in central New York; gray iron medium and small castings; 20 molders; 5-ton heats. Address Box 181, A. M.

Machinist contractor wanted to handle about 15 men; one acquainted with steam, oil and gas engines preferred. T. M. D., AMERICAN MACHINIST.

Wanted—Two first-class mechanical draftsmen with considerable experience in designing detail electrical apparatus. Address Box 194, AMERICAN MACHINIST.

Foundry foreman; one who can take charge of 150 men and produce results; state experience, salary wanted and age. Address "Ohio," care AMERICAN MACHINIST.

Expert layer-out for boiler shop; one accustomed to laying out intricate work from blueprints. Address, giving age, experience and salary expected, L. O., care AM. MACH.

Wanted—An instructor in mechanical engineering; shop and drawing-room experience, also diploma from technical school, required. Address, stating qualifications, age, etc., Box 153, AMERICAN MACHINIST.

Wanted, Immediately—12 first-class toolmakers; none but those accustomed to fine work need apply; also 12 first-class, all-around machinists. Address Driggs-Seabury Gun & Ammunition Co., Derby, Conn.

Wanted—Man to take charge of die department, who is experienced in handling men and in the construction of sheet metal working dies, by a concern in large town in western New York. Address "Folsom," care AM. M.

Printing press machinists wanted for England; American wages paid; men having had experience with Campbell and Miehle machines given preference. Address Printing Machinery Co., Ltd., 15 Tudor st., London, England.

Pattern maker, accustomed to steam-engine work; concern employs 8 to 10 pattern makers; attractive New England town; good prospects for capable young man; give age, experience, references and pay expected. Box 190, AMERICAN MACHINIST.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

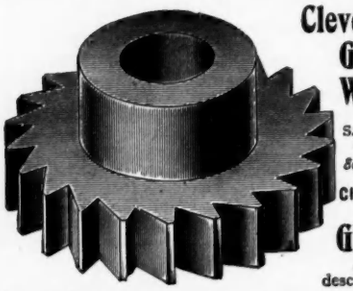
Foreman boiler maker, by a shop employing about 150 men; man must have complete knowledge of all details, and be able to handle men to good advantage; good salary to right man. Give age, reference and salary expected to F. B. M., care AMER. MACHINIST.

We can use on heavy boring machines, planers and large lathes several first-class machinists who can and will make these machines do all they were designed to do; unless you can earn 30 or more cents per hour do not apply. Gates Iron Works, 650 Elston ave., Chicago.

Foundry Foreman—Iron and brass foundry department of New England concern manufacturing engines and machinery requiring first-class castings; foundry employs 30 to 40 men; large town, attractively located; give experience, references and pay expected. Box 173, AMERICAN MACHINIST.

Wanted—By a manufacturing company, in their general offices, New York City, a mechanical engineer (technical graduate preferred) as salesman and assistant to manager; should have had shop experience, or as machinery salesman. Address, stating age, references, past experience and compensation expected, "Graduate," care AMER. MACHINIST.

A well-established machine-tool shop, located on the Rhine, Germany, desires the services of a first-class, experienced constructing engineer; one familiar with the designing and construction of hydraulic machinery adapted to shipbuilding; position permanent to the right man; one conversant with the German language preferred. State salary and references, addressing "Engineer," care David Williams Co., 5th & Main sts., Cincinnati, O.



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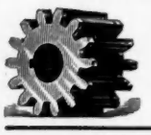

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ON PAGE 34

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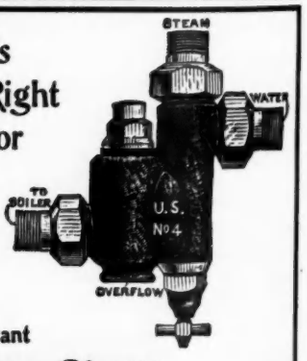

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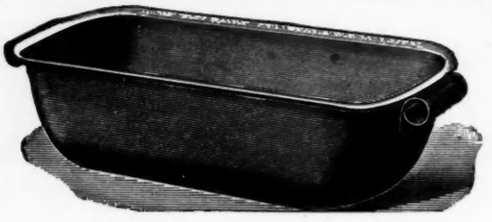

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